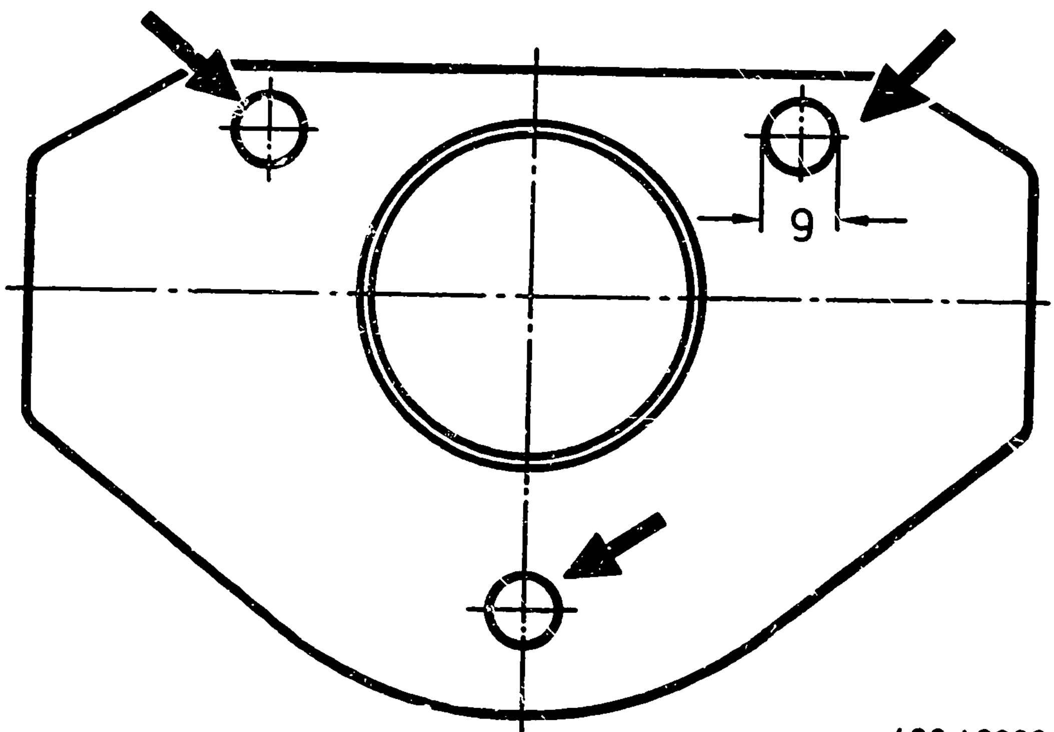
DISTRIBUTOR-TYPE FUEL-INJECTION PUMP VE..F..

Workshop: EP
12.1988

Clamping flange
1 685 720 219

0146 En

Changes must be made to the tapped holes (arrows) at the clamping flange in the through holes (diameter 9.0 mm), so as to be able to clamp the distributor-type fuel-injection pump VE..F.. of the Ford engine series 1.8 IDI and 2.5 DI with M 8 thread to the pump flange.



460/2003

3 hexagon bolts M 8 x 40 mm are to be used to clamp pumps with slots to the pump flange.

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New cold-start accelerator (KSB)
9 460 620 001 - Pump with temperature-controlled (KSB) acting on cam roller ring.

The cold-start accelerator causes the start of injection to be advanced when the engine is cold.

The temperature-controlled cold-start accelerator at the cam roller ring controls the start of injection automatically as a function of cooling-water temperature.

Components of temperature-controlled cold-start accelerator (KSB)

1 = KSB lever

2 = Advance-control-travel adjusting screw

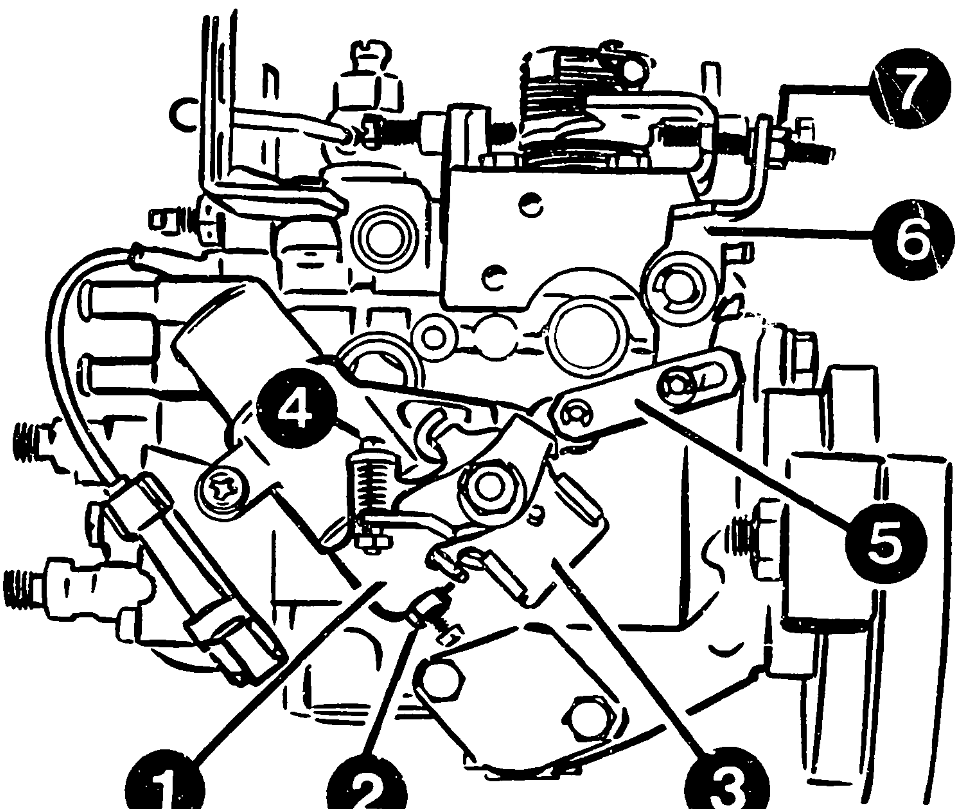
3 = Tensioning lever

4 = Intermediate-lever adjusting screw

5 = Connecting link

6 = Intermediate lever

7 = High-idle adjusting screw

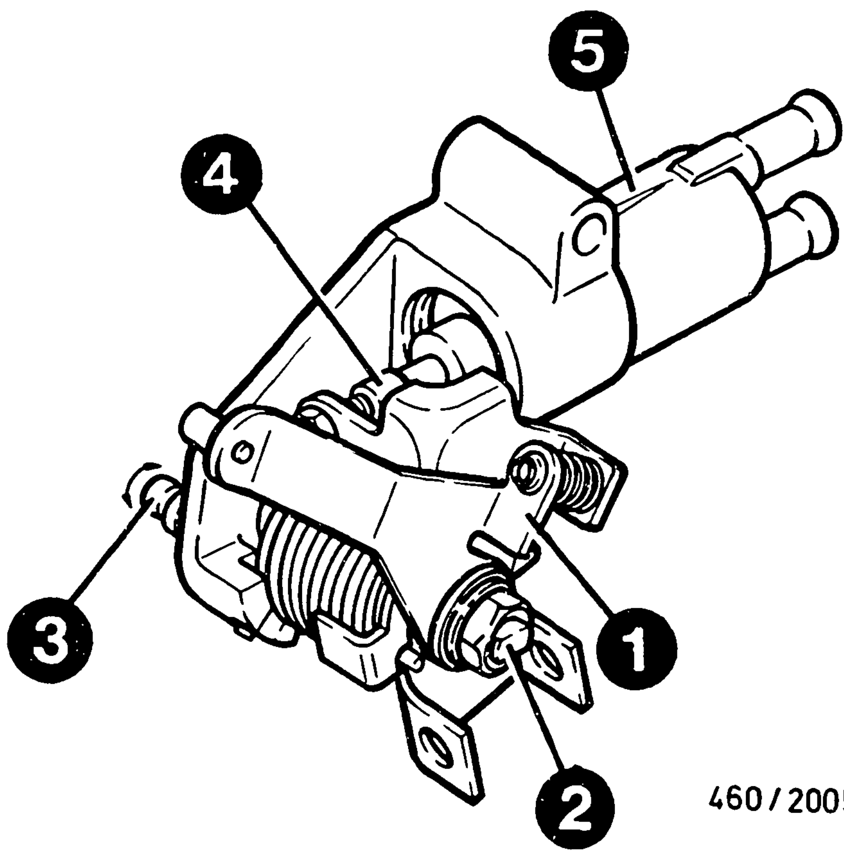


Description of operation:

With decreasing temperature, the pre-tensioned KSB lever presses the lifting rod into the KSB housing and turns the KSB setting shaft in a clockwise direction.

In this process, the eccentric is pressed against the cam roller ring and shifts it in the direction of advanced injection.

1 = KSB lever
2 = KSB setting shaft
3 = Eccentric
4 = Lifting rod
5 = KSB housing



460/2005

As the engine warms up, the lifting rod moves against the pre-tensioned KSB lever and turns the eccentric in a counter-clockwise direction.

This process causes the KSB lever to re-assume its original position. The cam roller ring is moved in the direction of retarded injection again.

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M-PUMP WITH RSF-GOVERNOR Workshop: EP
12.1988
0148 En

New control-rod closure cap
Modification to fuel-injection pumps with start-of-delivery sensor system (FBG)

When replacing control-rod closure caps, metal chips may be sheared off on installing the pre-stamped closure caps and these chips may then become deposited between control rod and control-rod guide sleeve.

Consequence: Control rod does not move freely or jammed.

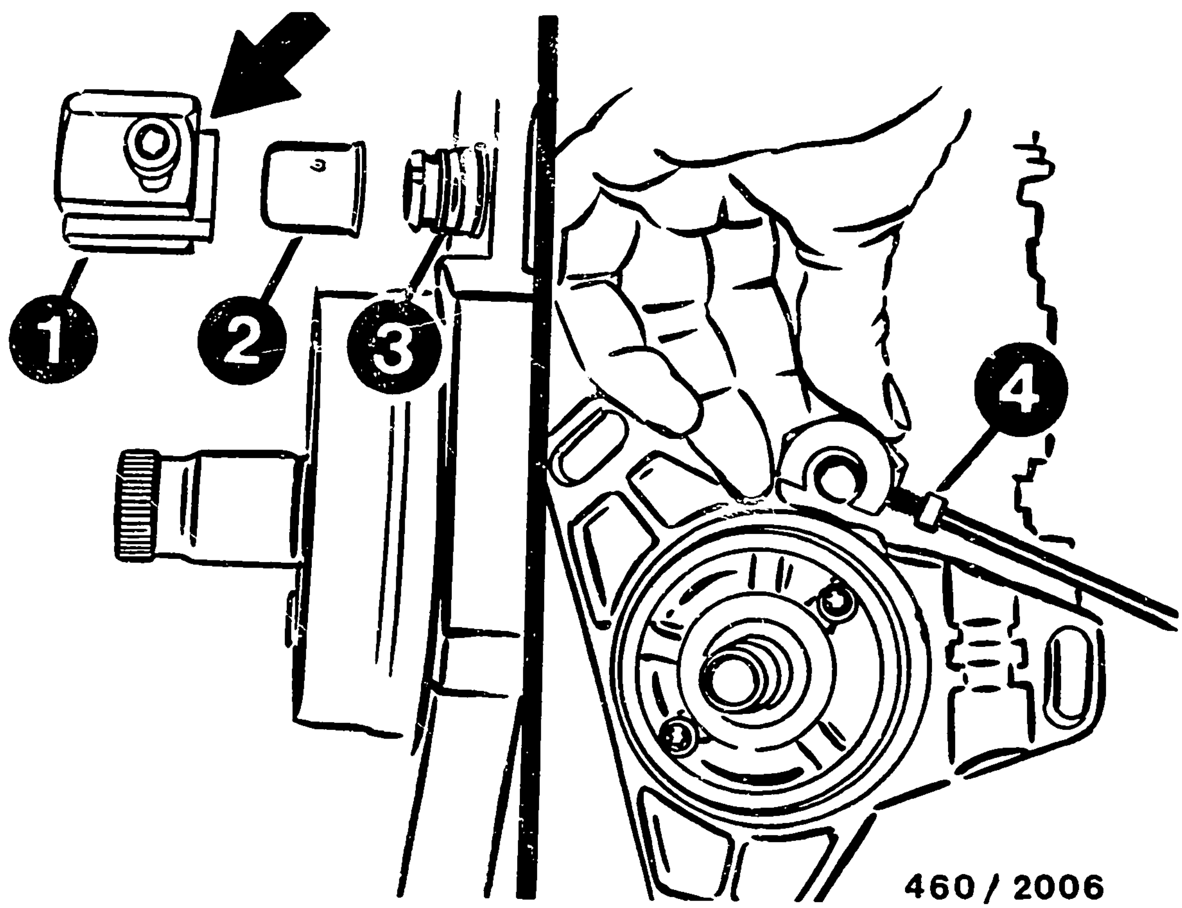
In order to prevent this, the bushings with part no. 1 420 505 063 are now only available without a stamp and must be stamped with the stamping tool KDEP 1635 following assembly.

1 = Stamping tool KDEP 1635

2 = Control-rod closure cap

3 = Control-rod guide sleeve

4 = Hexagon-socket-head cap screw



460 / 2006

Assembly instructions:

Slip closure cap on to control-rod guide sleeve as far as it will go.

Push stamping tool KDEP 1635 over guide sleeve such that machined collar (arrow) makes contact with pump housing.

Screw in hexagon-socket-head cap screw until increased resistance is felt.

Remove stamping tool.

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DISTRIBUTOR-TYPE FUEL-INJECTION PUMP
VE..F.. R288,
-1, -2, -3

Workshop: EP
12.1988
0149 En

Setting of start-of-delivery blocking in line with plunger lift

The distributor-type fuel-injection pump features the following add-on modules:

* Hydraulically-operated torque control (HBA)
* Temperature-controlled cold-start accelerator (KSB) acting on cam roller ring.
* Temperature-controlled idle-speed increase (TLA)
* Third injected-quantity stop for adjusting part-load delivery (exhaust-gas recirculation).

Special tools required:

* Range spacer KDEP 1176
* Setting mandrel KDEP 1173
* Timing-device cover KDEP 1151
* Timing-device measuring tool KDEP 2601 attached on timing-device-spring end
* Parts set 1 460 100 904

Preparation of pump for testing:

Remove coupling half (pump component). Fit driving coupling 1 686 430 010 and modified clamping flange 685 720 219 (enlarge M8 thread in 9.0 mm hole). Attach fuel-injection pump with necessary test equipment to injection-pump test bench.

Attach timing-device measuring tool KDEP 2601 as follows:

* Remove timing-device cover on spring end.

* Remove existing timing-device shims (hole 5.3 mm) from timing-device cover as well as inside shim in timing-device piston. Measure overall shim thickness.

* Install shims (hole 7.8 mm) from parts set 1 460 100 904 with same shim thickness in timing-device piston and timing-device cover.

* Fit timing-device measuring tool with timing-device spring.

Carry out testing and adjustment in accordance with test instructions W-460/300 and W-460/304.

Differing adjustment sequence:

Set part-load delivery (exhaust-gas-recirculation rate).

Position range spacer (11.8 mm spacer) KDEP 1176 at third injected-quantity stop.
Make up difference with respect to setting 12.0 mm using feeler gauge.

Press speed-control lever against range spacer and measure part-load delivery.

Adjustment by way of adjusting screw at third injected-quantity stop.

Following completion of testing, remove original timing-device cover on pressure side.

Fit timing-device cover KDEP 1151 with 3 mm collar on pressure side.

Remove driving coupling and push on to drive shaft without fastening nut.

Adjustment of start-of-delivery blocking in line with plunger lift:

Remove bleeder screw and attach plunger-lift measuring tool KDEP 1085.

Set dial indicator to "zero" in BDC position of distributor-type fuel-injection-pump plunger.

Turn pump drive shaft in direction of pump rotation until set value of 0.55 + – 0.05 mm referenced to outlet "B" is attained.

Repeat adjustment procedure if set value is overshot.

Remove support plate of locking screw and keep it safe.

Screw in locking screw and block drive shaft.

Tightening torque of locking screw 27...35 Nm.

Note:
Observe set value while drive shaft blocked.

Repeat adjustment procedure if set value deviates following blocking.

Remove plunger-lift measuring tool and bleeder screw.

Remove driving coupling and clean tapered surfaces.

Attach coupling half and turn until setting pin KDEP 1173 can be inserted through coupling half into setting hole.

Attach fastening nut to coupling half and tighten to 30 Nm.

Adjustment of temperature-controlled cold-start accelerator (KSB) with temperature-controlled idle-speed increase (TLA) acting on cam roller ring

Turn pump plunger to BDC position.

Adjust KSB control lever in direction of control housing until pressure is felt.

Measure distance between ball stud and speed-control lever.

Distance: 12.7 mm

Adjust by moving ball stud.

Remove timing-device cover (on pressure side).

Attach timing-device cover KDEP 1151 with 3 mm collar.

Move KSB setting lever on control-cable plane in direction of control housing until pressure is felt.

In this position there must be 2.2...2.4 mm between idle stop screw and speed-control lever.

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KBEL../KCA.. Workshop: EP
NOZZLE-HOLDER ASSEMBLY 01.1989
WITH NEEDLE-MOTION SENSOR 0150 En

Repair instructions

The position of the spindle in the nozzle-holder assembly changes when replacing nozzle-holder-assembly components and/or a nozzle.

This results in the change having an effect on the magnitude of the signal voltage and in incorrect evaluation by the control unit.

The nozzle-and-holder assembly is to be renewed in the event of damaged nozzle-holder-assembly components and/or a damaged nozzle.

As opposed to information given previously, the nozzle-opening pressure must n o t be adjusted.

The complete nozzle-and-holder assembly is to be renewed in the event of a deviation in opening pressure.

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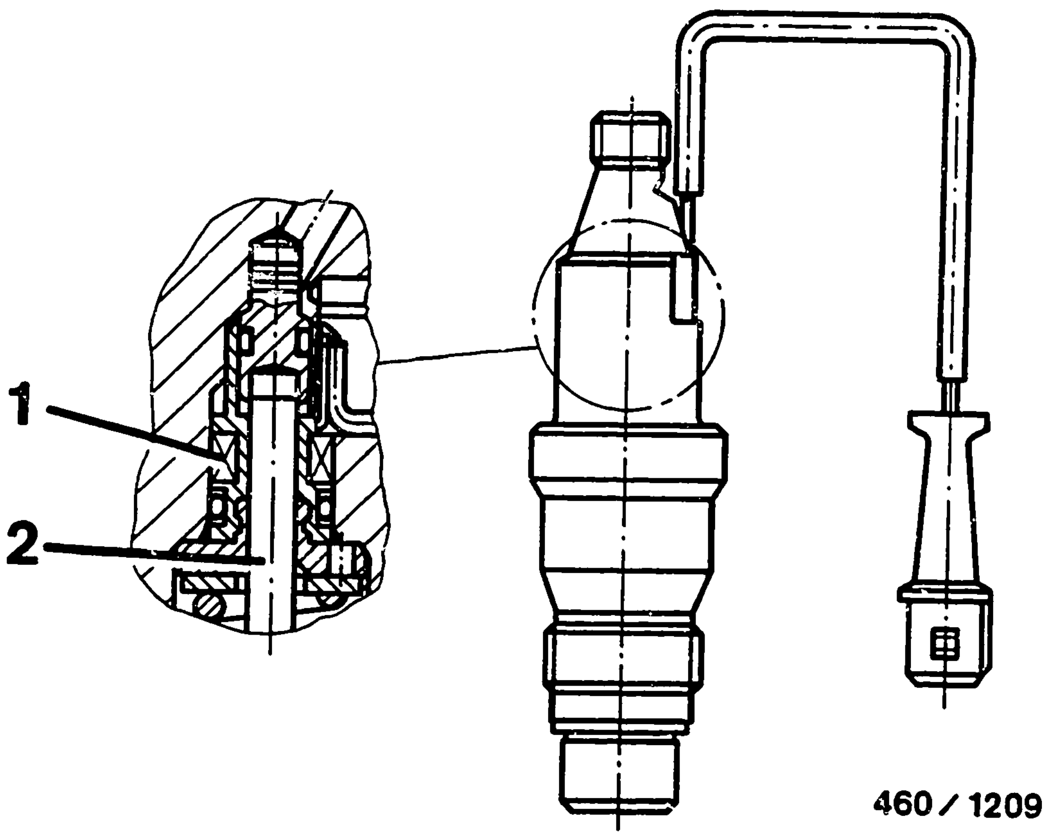
1 = Needle-motion sensor
2 = Sindle



TESTING AND ADJUSTMENT WORK ON BOSCH FUEL-INJECTION PUMPS

Workshop: EP
02.1989
0153 En

Assessments of test records for BOSCH fuel-injection pumps have revealed that most of these pumps are reported without justification during the warranty period.
The most frequent error observed was that the mean delivery value stated in the test-specification sheet (Microcard WP...) had been compared to each individual outlet of the fuel-injection pump.

This is wrong because only the average (arithmetic mean) of all outlets can be compared to the mean value in the test-specification sheet.

For this reason we should like to take this opportunity to point out once again the following guidelines for the testing and adjustment of BOSCH fuel-injection pumps:

1. The test specifications given in the after-sales-service test-specification sheets (Microcards WP...) govern the testing and adjustment of BOSCH fuel-injection pumps. Only these values have been released by our original-equipment customers and they must therefore be strictly adhered to.

   In the event of complaints regarding performance and/or consumption, the delivery can be set at cost to the upper limit of the adjustment tolerance and to optimum scatter.

2. The delivery must be assessed by comparing the arithmetic mean of all fuel-injection-pump outlets (actual value) to the delivery tolerance stated in the test-specification sheet (set value).

   The scatter is assessed by comparing the difference between the fuel-injection-pump outlets providing maximum and minimum delivery to the scatter stipulated in the test-specification sheet.

Assessment is necessary since it is not always possible to see "at a glance" whether a fuel-injection pump is exceeding the test-specification tolerances. Evaluation is best performed with a pocket calculator.

Example: Set values from BOSCH test-specification sheet

* Full-load delivery setting:
  126...128 cm3
* Full-load-delivery test specification
  (value in brackets):
  123.5...130.5 cm3 per 1000 strokes
* Scatter test:
  8 cm3 per 1000 strokes

Actual values measured at pump:

Cylinder No.	Delivery
1	122
2	122
3	130
4	124
5	123
6	122
7	123
8	124
9	123
10	122

Actual mean value

$$= \frac{\text{Sum total of deliveries of all barrels}}{\text{Number of cylinders}}$$

$$= \frac{1235 \text{ cm3}}{10} = 123.5 \text{ cm3}$$

Actual scatter
= Difference between highest and lowest delivery value of individual barrels

= 130 cm3 - 122 cm3 = 8 cm3

As regards delivery, this fuel-injection pump would be within the tolerances stipulated in the test-specification sheet and would not represent a warranty situation.

Despite the fact that in this example individual barrels are outside the test tolerance, the pump is O.K. as regards its delivery, since the arithmetic mean is inside the set value. The delivery adjustment and test tolerances indicated in the test specifications are thus only valid in conjunction with the arithmetic mean which is not to be used for individual assessment of a particular outlet.

3. The inlet and outlet values of the fuel-injection pump are to be documented in the test record for fuel-injection pumps. The test record is to be handed over to the customer automatically together with the fuel-injection pump. Documentation of the inlet values is particularly important when it comes to complaints regarding performance and fuel consumption. The "remarks" column should be used to give information which makes it possible to reconstruct the after-sales-service situation (complaint, work performed). A copy of the test record must be kept together with the job card for 2 years.

Recording the inlet values is not necessary in the case of pumps where the as-delivered condition/order clearly make incoming inspection superfluous.

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DISTRIBUTOR-TYPE FUEL INJECTION PUMPS
6/10 F 2400 L 116 or
6/10 F 2400 L 116-5
(0 460 406 018 or
0 460 406 036)

Workshop: EP
02.1989
0156 En

Complaint regarding "part-load bucking" on Volvo 760 2.4 Turbo-Diesel

If a complaint is received regarding "part-load bucking" in the above-mentioned vehicle, the situation can be improved by fitting the part load governor

1 463 162 020

in place of the part load governor 1 463 161 772 installed as standard up to date of manufacture 852 (12.88).

As of date of manufacture 941 (01.89), the part load governor 1 463 162 020 is being fitted as standard on the above-mentioned distributor-type fuel-injection pumps.
The costs of replacing the part load governor are to be invoiced.

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ELECTRONICALLY
CONTROLLED DIESEL
FUEL INJECTION WITH
DISTRIBUTOR-TYPE FUEL-
INJECTION PUMP

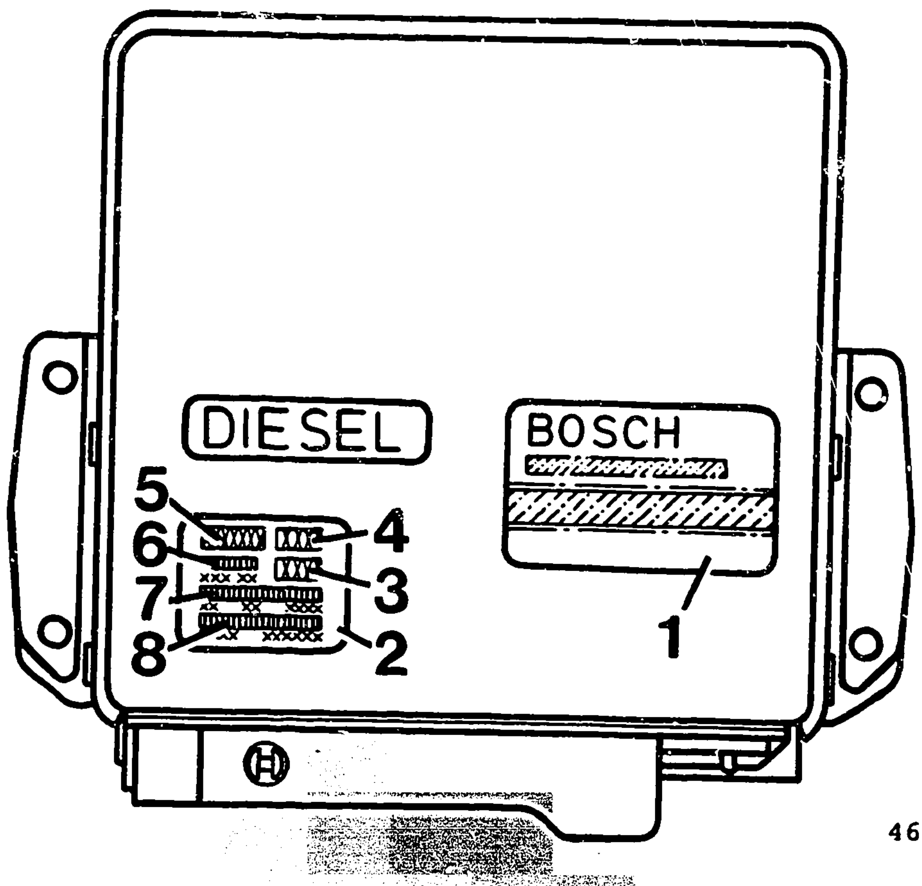
Workshop: EP
03.1989
0154 En

Permitted combinations
of control units MSA1-BMW

Various modifications (software and hardware) to the control units have led to a situation where control-unit variants cannot be freely combined.

In addition to the normal nameplate, the control units feature an additional encoding plate.

1 = Nameplate
2 = Encoding plate
3 = Factory code
4 = Variant no.
5 = Customer no.
6 = Date of manufacture with calendar day
7 = Modification status
8 = Consecutive no.



460/2035

The exchange of control units is to be carried out in line with the following criteria:

1. It is only possible to exchange control units with the same BOSCH part no., e.g. replace 0 281 001 077 with new unit 0 281 001 077

2. Item 1 applies to control units 1 and control units 2 independently of one another
(control unit 1 = 35-pole edge connector,
control unit 2 = 25-pole edge connector).

3. The new unit must have the same or a higher-ranking variant no. and may feature an additional identifier (e.g. date of manufacture with calendar day) on encoding plate.

   A further color code is also possible in addition to these identifiers.

4. The following units are not covered by this stipulation:

BMW 324 td (E30)

Part No.	Variant No.
0 281 001 064	3T1 and 3T2
0 281 001 066	3T1 and 3T2

These units must be replaced by

0 281 001 064	3T3
0 281 001 066	3T3

BMW 524 td (E34)

Part No.	Variant No.
0 281 001 077	5T1 and 5T2
0 281 001 080	5T1 and 5T2

These units must be replaced by

0 281 001 077	5T3
0 281 001 080	5T3

Permitted combinations of control units for BMW 324 td (E30):

Control unit 1 (35-pole)	Control unit 2 (25-pole)
3T3	3T1
3T3	3T2
3T4	3T4*
3T4 (green)	3T4*
3T4 (green)	3T5
3T5	3T4*
3T5	3T5

Control unit 1 (35-pole)	Control unit 2 (25-pole)
3T5 FD 941.19	3T4*
3T5 FD 941.19	3T5

* If an exchange part 3T5 is replaced by one of these units, there is no monitoring of the water-level sensor.

(Green) = green dot code on edge connector

Permitted combinations of control units for BMW 524 td (E34):

Control unit 1 (35-pole)	Control unit 2 (25-pole)
5T3	5T1
5T3	5T3
5T3	5T4
5T3	5T5
5T4	5T1
5T4	5T3
5T4	5T4
5T4	5T5

Control unit 1 (35-pole)	Control unit 2 (25-pole)
5T4 green	5T1
5T4 green	5T3
5T4 green	5T4
5T4 green	5T5
5T5	5T1*
5T5	5T3*
5T5	5T4*
5T5	5T5

Control unit 1 (35-pole)	Control unit 2 (25-pole)
5T5 FD 941.19	5T1*
5T5 FD 941.19	5T3*
5T5 FD 941.19	5T4*
5T5 FD 941.19	5T5

* If an exchange part 5T5 is replaced by one of these units, there is no monitoring of the water-level sensor.

(Green) = green dot code on edge connector

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DISTRIBUTOR-TYPE FUEL-INJECTION PUMP VE..F..
Housing repair

Workshop EP
03.1989
0157 En

Changing bushing(s) of drive shaft and at housing cover

Distributor-type fuel-injection pumps may be subject to leakage at the housing cover between the bronze bushing and the control-lever shaft as well as to wear at the drive end shield of the distributor-type fuel-injection-pump housing.

These bushings can be replaced to eliminate such leaks.

The following steel bushings are available for repairing housing covers.

Part No. Steel bushing	Length
1 460 324 315	19.9 mm
1 460 324 316	24.4 mm
1 460 324 331	40.6 mm
1 460 324 332	35.1 mm
1 460 324 333	30.6 mm
1 460 324 337	33,7 mm

Bushings of drive shaft	Diameter
1 460 400 004	17 mm
1 460 400 014	20 mm

Special tools required

Set of tools KDEP 1132 for control-lever bushings comprising:

* Pressing-out, pressing-in mandrel	KDEP 1132/0/1
* Spacer plate	KDEP 1132/0/2
* Support ring, short	KDEP 1132/0/3
* Support ring, long	KDEP 1132/0/4

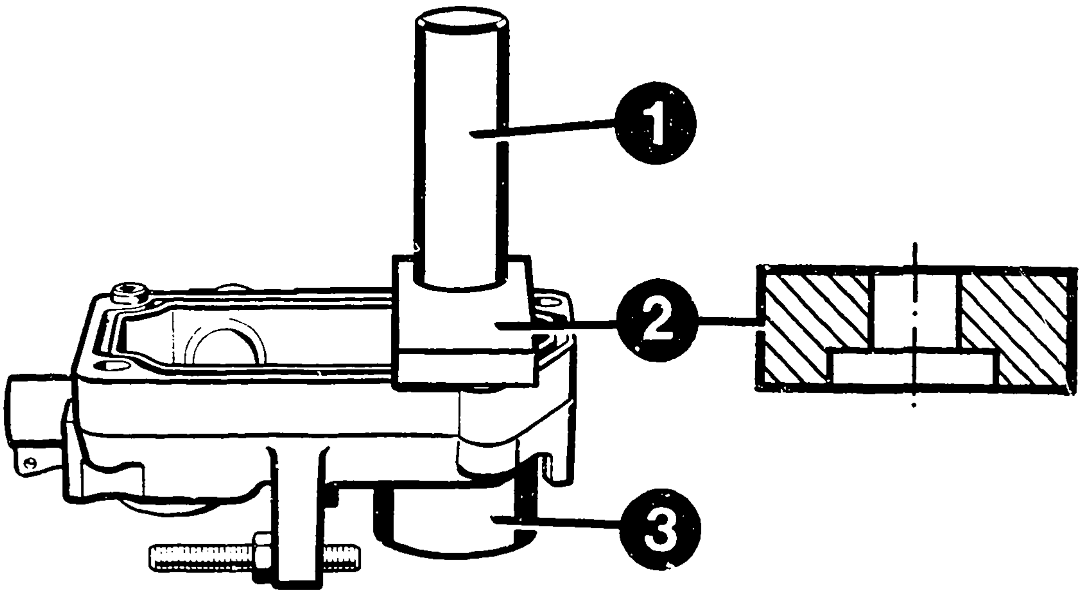
BUSHING REPLACEMENT

Remove housing cover.
Remove attachments (e.g. control lever, full-load adjusting screw).
Insert die spigot KDLJ 6010 into die of mandrel press.
Screw pressing-out mandrel KDEP 1132/0/1 into die spigot.
Press out bronze bushing.
Wash out housing cover, hole for bushing must be grease-free.
Examine bore for longitudinal scoring or similar damage.
Fit new housing cover if freedom from leaks between bushing and housing-cover bore does not seem guaranteed.

PRESSING IN STEEL BUSHING

Place housing cover on support ring; use long support ring in the case of housing cover with LDA, otherwise utilize short support ring.
Position spacer plate on housing cover with countersink facing pressing-in mandrel. Apply Loctite 582 Part No. 5 928 150 000 to O.D. of steel bushing.
Use pressing-in mandrel to press in steel bushing with collar height 2.5 mm straight and flush until mandrel makes contact with countersink of spacer plate.

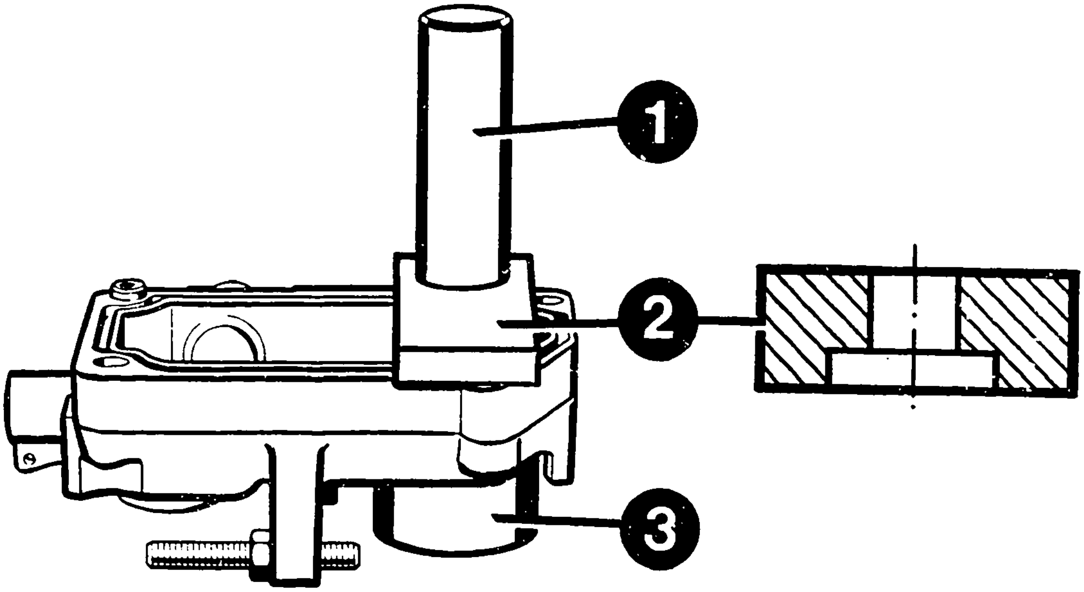
1 = Pressing-in mandrel
2 = Spacer plate
3 = Support ring



460/2036

Position spacer plate with countersink facing downwards on housing cover. Use pressing-in mandrel to press in steel bushing with collar height 7.0 mm straight and flush until mandrel makes contact with spacer plate. Fit attachments (e.g. control lever, full-load adjusting screw) and attach housing cover to distributor-type fuel-injection pump.

1 = Pressing-in mandrel
2 = Spacer plate
3 = Support ring



460/2036

TESTING HOUSING COVER FOR LEAKS

The Loctite 582 becomes serviceable after approx. 45 minutes at ambient temperature.
Seal overflow at distributor-type fuel-injection pump with screw plug.
Make compressed-air connection at intake end of distributor-type fuel-injection pump and subject to pressure-test at 8 bar.
Place distributor-type fuel-injection pump in calibrating-oil reservoir.
Air bubbles may not emerge between bushing and housing cover within 20 second test period (pressurization time).

Following completion of repairs, adjust fuel-injection pump on injection-pump test bench.

REPLACING BUSHINGS OF DRIVE SHAFT

Special tools required

Set of tools KDEP 1170 for drive-shaft diameter 17.0 mm comprising:

* Pressing-out mandrel KDEP 1170/1
* Pressing-in mandrel KDEP 1170/2 (pressing in inner bushing)
* Pressing-in mandrel KDEP 1170/3 (pressing in outer bushing)
* Guide sleeve KDEP 1170/4
* Hand reamer KDEP 1170/5
* Holding fixture KDEP 1170/6

Set of tools KDEP 1171 for drive-shaft diameter 20.0 mm comprising:

* Pressing-out mandrel KDEP 1171/1
* Pressing-in mandrel KDEP 1171/2 (pressing in inner bushing)
* Pressing-in mandrel KDEP 1171/3 (pressing in outer bushing)
* Guide sleeve KDEP 1171/4
* Hand reamer KDEP 1171/5

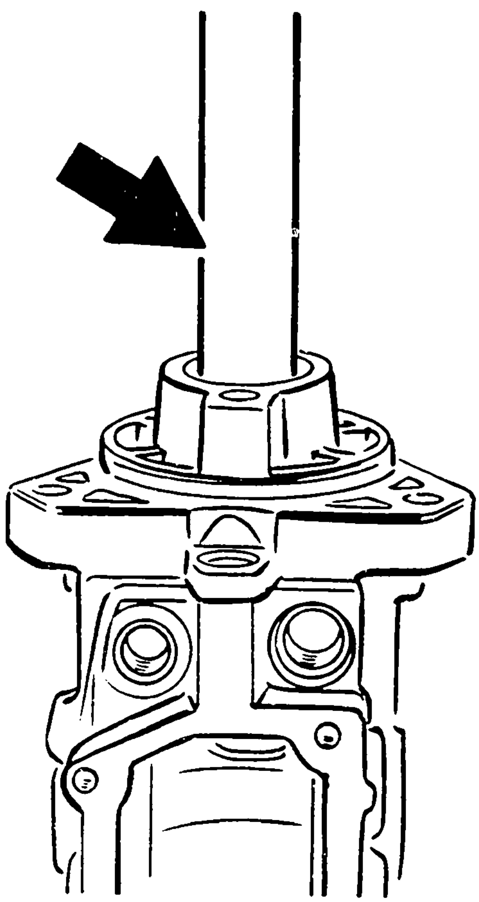
Note:
Use holding fixture KDEP 1170/6 for guiding pressing-in mandrel KDEP 1171/2 and reamer.

Disassemble distributor-type fuel-injection pump in accordance with repair instructions W-460/100.

Place fuel-injection-pump housing with holding fixture KDEP 1170/6 flat on support plate of mandrel press.
If applicable, remove burr at pump housing (end face of distributor head).

Press out bushings on drive end with pressing-out mandrel in line with drive-shaft diameter.
Wash out housing, hole must be grease-free.

Arrow = pressing-out mandrel

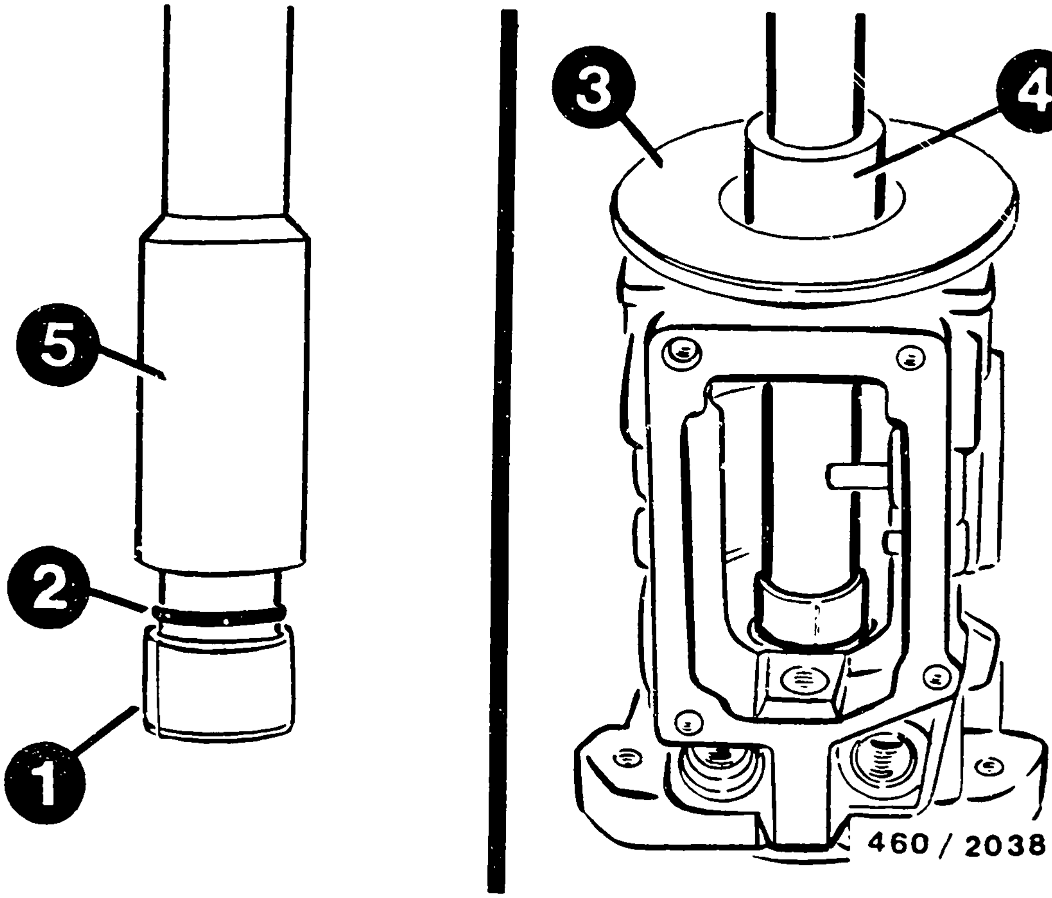


460 / 2037

PRESSING IN BUSHINGS

Position pump housing flat on support plate of mandrel press on drive end. Press new bushing over O-ring of pressing-in mandrel. Apply Loctite 582 to O.D. of bushing. Insert support ring into pump housing. Press in inner bushing straight and flush until it makes contact in pump housing.

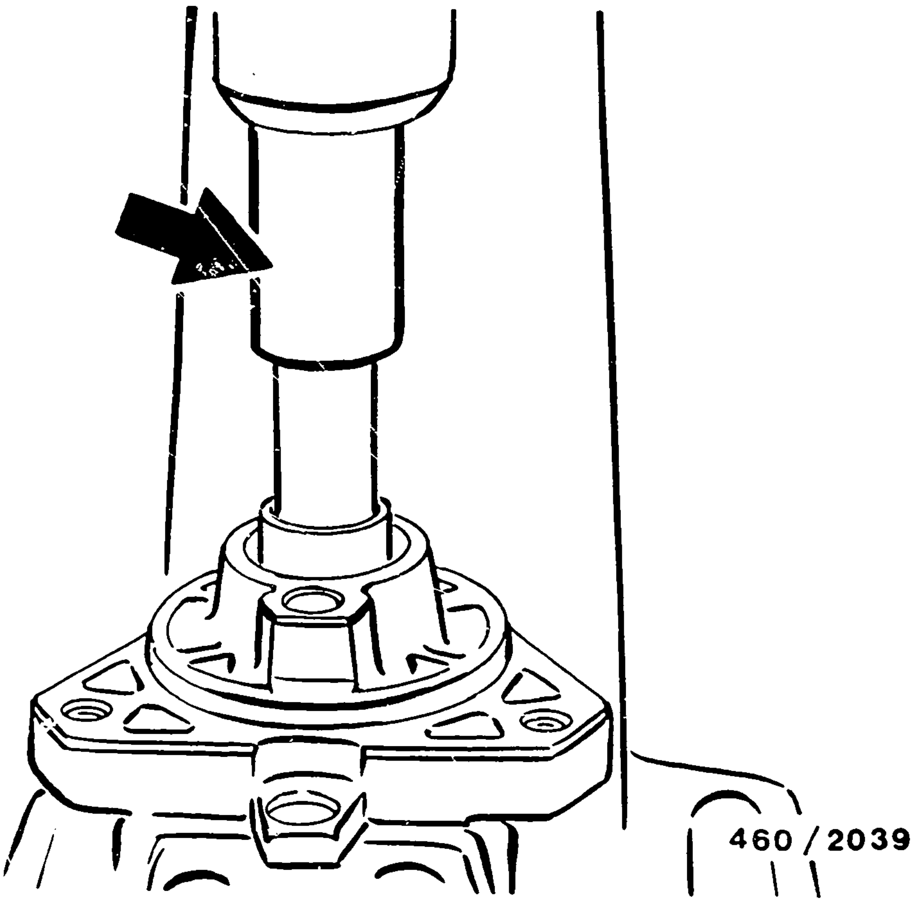
1 = Bushings
2 = O-ring
3 = Support ring
4 = Guide sleeve
5 = Pressing-in mandrel



Insert holding fixture KDEP 1170/6
into pump housing.
Position fuel-injection-pump housing
with holding fixture on support plate
of mandrel press.

Position bushing in pressing-in
mandrel with long guide pivots.
Apply Loctite 582 to O.D. of bushing.
Insert pressing-in mandrel into already
pressed-in bushing and press in
bushing flush on drive end.
Remove residual adhesive.

Arrow = Pressing-in mandrel with
long guide pivot



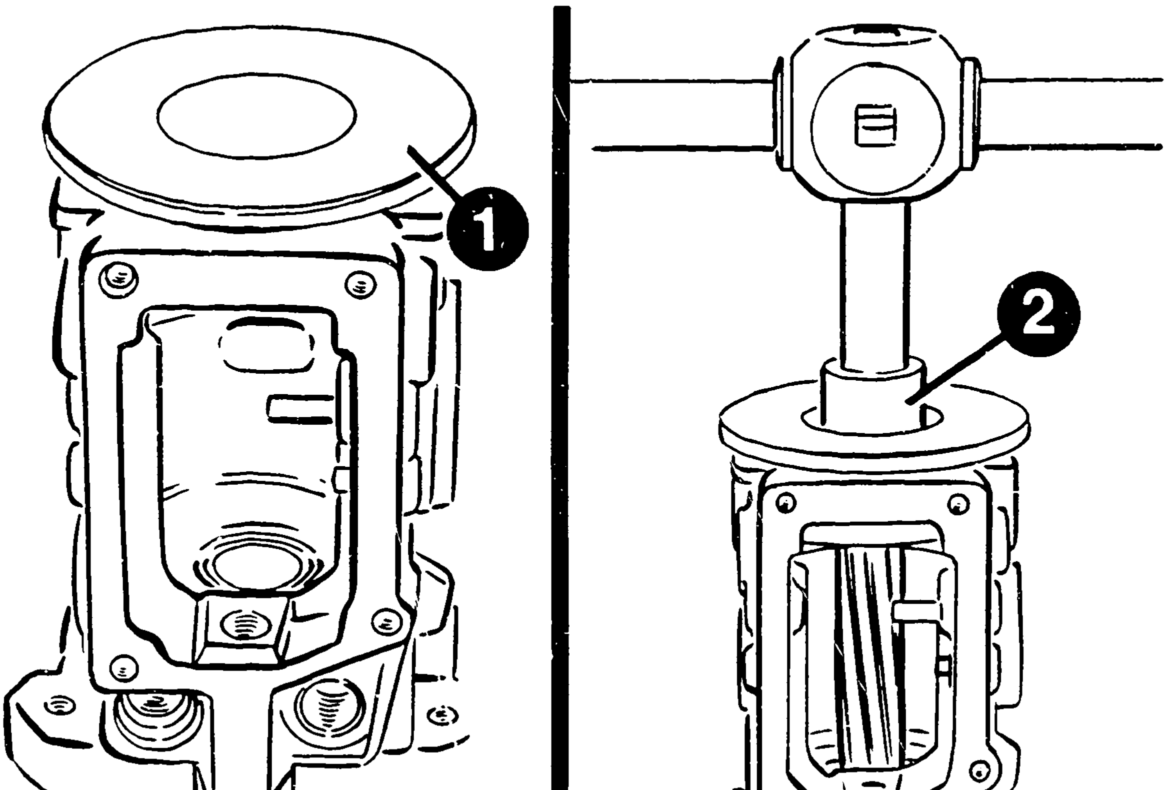
REAMING BUSHINGS

Shaft diameter 20 mm:

Place fuel-injection-pump housing flat on support plate of mandrel press on drive end.
Insert support ring into pump housing.
Insert hand reamer into support ring.

Fit guide sleeve in line with reamer diameter in support ring.
(Recessed collar faces upwards).

1 = Support ring
2 = Guide sleeve



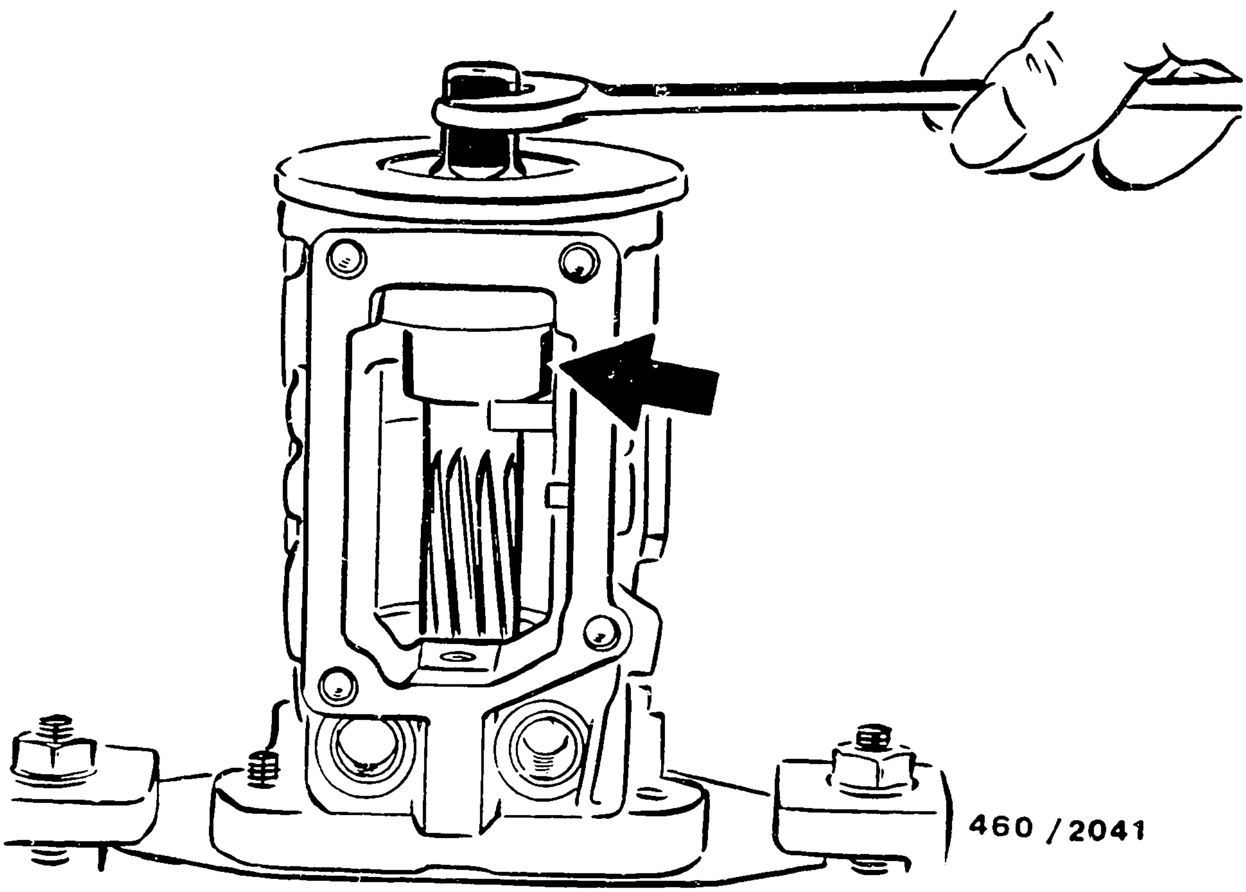
Attach wrench to reamer and ream inner bushing with oil.

Turn guide sleeve (recessed collar diameter faces in direction of pump housing - arrow).
Ream second bushing.

Ream last 2 cm with guide sleeve and open-end wrench.

Fit drive shaft and check for freedom of movement.

Make repair mark.

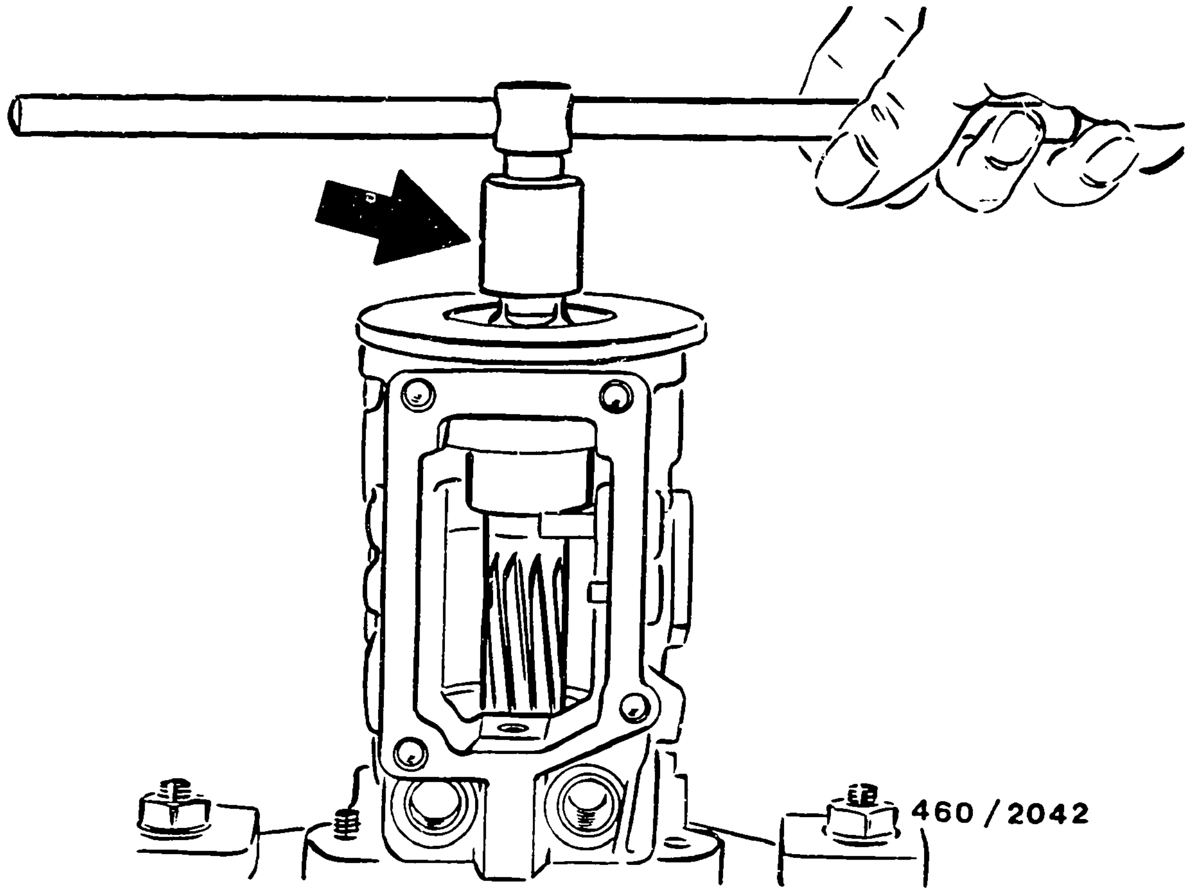


Shaft diameter 17 mm:

Place fuel-injection-pump housing flat on support plate of mandrel press on drive end.
Insert support ring into pump housing.
Insert hand reamer into support ring.

Fit guide sleeve in line with reamer diameter in support ring.
(Recessed collar faces upwards).

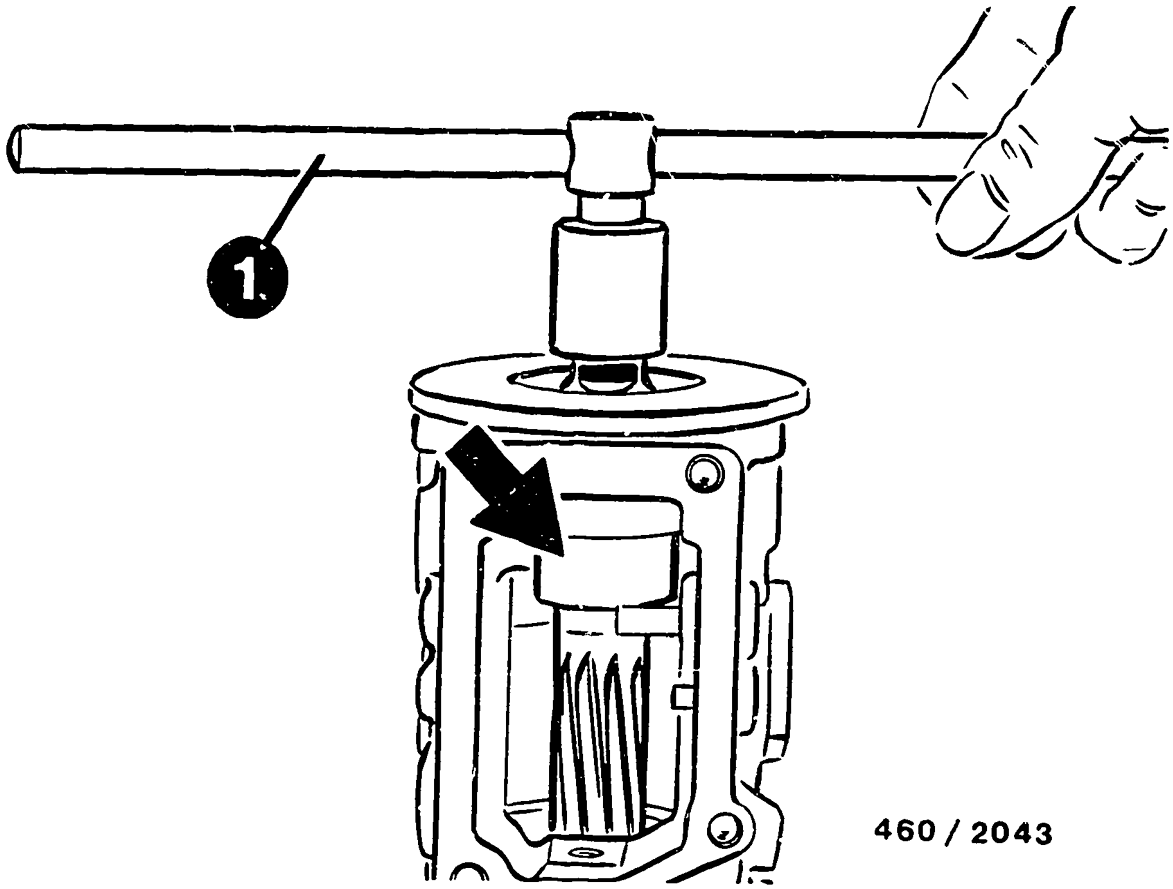
Insert intermediate piece (arrow) into square socket of hand reamer.



Insert cross-wrench (tommy) into intermediate piece.
Ream inner bushing with oil.

Turn guide sleeve (recessed collar diameter faces in direction of pump housing/arrow).
Ream second bushing.
Ream the last 2 cm without guide sleeve.
Fit drive shaft and check for freedom of movement.
Make repair mark.

1 = Cross-wrench



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ABBREVIATIONS
FOR TECHNICAL TERMS
AND COMPONENTS OF
DIESEL FUEL-INJECTION
SYSTEMS IN ALPHABETICAL
ORDER

Workshop: EP
04.1989
0159 En

Abbreviation	Technical term/component
ADA	Ambient pressure dependent full load stop
ADF	Ambient pressure sensor
AFB	Ambient pressure dependent port closing
ALDA	Absolute boost pressure dependent full load stop
ALFB	Barometric pressure and load dependent start of delivery
ARD	Active surge damping
ARF	Exhaust gas recirculation (EGR)
ASR	Traction control

AWG	Signal processing unit
DFB	Dynamic timing adjustment
DHK	Fuel injector
DI	Direct injection engine
DIA	Diagnosis
DMV	Diesel solenoid valve
DS	Pressure regulator
DV	Delivery valve

DVH	Delivery valve holder
DZG	rpms: rpm sensor, speed sensor
EDC	Electronic Diesel control
EES	Electric release of start fuel quantity
EHAB	Electro-hydraulic shut-off device
EHSW	Electro-hydraulic actuator
ELAB	Electric shut-off device

ELD	Electrical power on/off damper
ELR	Electronic idle control
EMAB	Electromotoric shut off device
EP	Adjustment point
FAP	Throttle (THR)
FBB	Locked timing
FBG	Start of delivery sensor

FD	Date of manufacture
FGB	Cruise limit
FGG	Vehicle speed sensor
FGR	Cruise control
FLD	Spring actuated power on/off damper
FP	Supply pump
GDV	Constant pressure valve
GGS	Governor control gear switch

GRV	Constant volume retraction valve
GS	Gear switch
GZS	Glow control unit
HBA	Hydraulic torque control
HSV	Hydraulic starting quantity de-activator
IDI	Indirect injected engine
ILV	Integrated smooth idle device

K-RWG	Eddy current travel sensor
KDS	Kickdown switch
KFMG	Continuous fuel delivery measurement device
KMM	Continuous fuel measurement device
KMMG	Continuous fuel measurement device (closed)
KSB	Cold start acceleration device
KSV	Cold start valve

KTF	Fuel temperature sensor
KW	Crankshaft
LDA	Boost pressure dependent full load stop
LDF	Boost pressure sensor
LFB	Load dependent start of delivery
LFG	Housing fixed idle spring
LFR	Low idle load control
LL	Idle

LLK	Boost air cooling
LLR	Low idle speed control
LMM	Air flow sensor
LP	Orifice plate
LTF	Air temperature sensor
MLA	Sleeve controlled load dependency
MLD	Mechanical power on/off damper
MV	Solenoid valve

NAS	Power take-off switch
NBF	Needle movement sensor
PDOE	Nozzle opening pressure
PLA	Pneumatic low idle stop
PNAB	Pneumatic shut-off device
PV	Test regulations
RE	Actuator of inline pumps

RP	Inline pump
RSD	Snubber valve
RW	Controller rack travel
RWG	Rack position sensor
SBR	Start of injection control
SG	Control unit
SPV	Timing device
STOE	External stop switch
SV	Timing device travel

SZ	Smoke number
TAS	Temperature dependent excess fuel quantity
TKU	Technical customer information
TLA	Temperature dependent low idle stop
TLK	Temperature dependent low idle correction

UEDS	Overspeed switch
UEV	Overflow valve
VGWX	Default value at sensor failure
VP	Distributor pump
WLR	Warm up control unit
WSKS	Converter switch
WTF	Water temperature sensor
ZDA	Intermediate speed control stop

TV	Cycle valve
TVA	Temperature dependent full load stop
ZDR	Intermediate speed control

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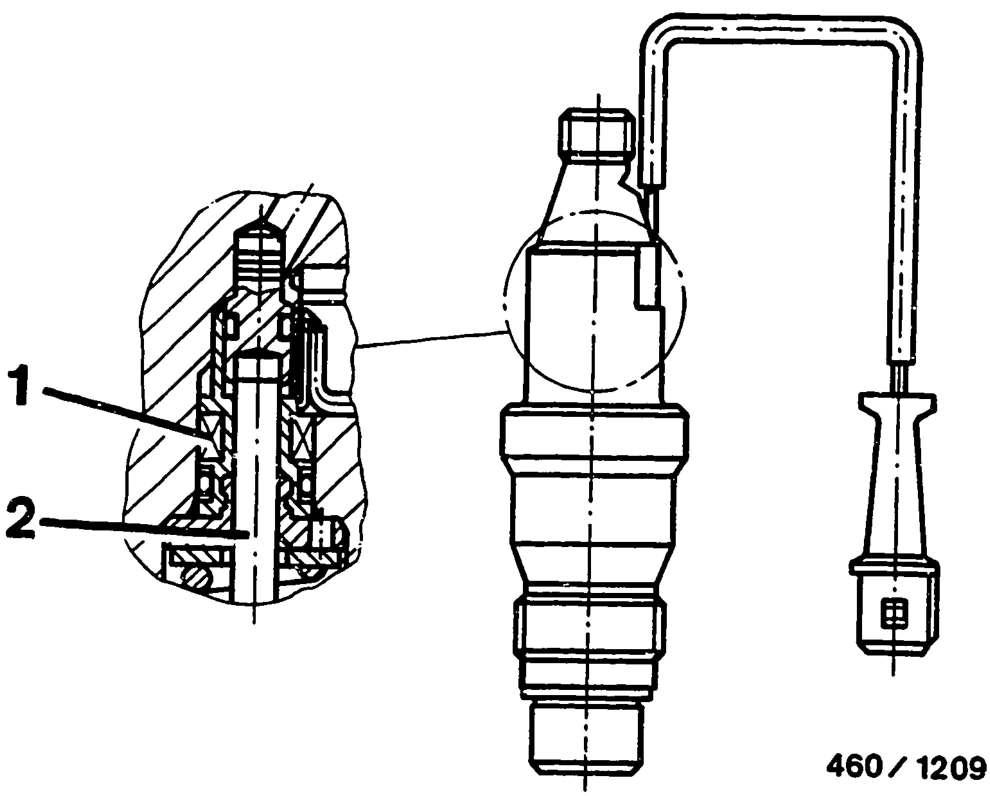
Replacing nozzle-holder-assembly components and/or a nozzle changes the position of the spindle in the nozzle-holder assembly.
This means that the change in position has an effect on the magnitude of the signal voltage and results in incorrect evaluation by the control unit.
1 = Needle-movement sensor
2 = Spindle

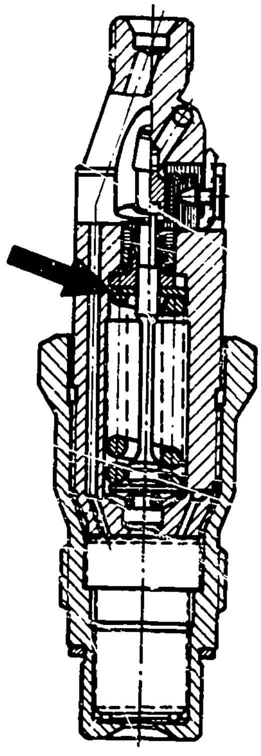


After cleaning a nozzle, the nozzle-and-holder assembly is to be reassembled with a l l c o m p o n e n t s p r e s e n t.
If damaged components are established during disassembly, the nozzle-and-holder assembly is to be renewed.

The nozzle is n o t to be exchanged.

If the nozzle opening pressure deviates from the set value, this is to be corrected by means of shims (picture, arrow). Special shims (larger diameter of hole) are to be used to correct the nozzle opening pressure.

Set values for nozzle opening pressures are to be taken from the vehicle-specific brief instructions.



460/2053

List of shims

Notes:
Thicker shim = higher nozzle opening pressure.
Thinner shim = lower nozzle opening pressure.

Changing the spring travel by 0.05 mm alters the nozzle opening pressure by approx. 5 bar.

Part no.	Shim thickness
2 430 101 110	0.80 mm
111	0.82 mm
112	0.84 mm
113	0.86 mm
114	0.88 mm
115	0.90 mm
116	0.92 mm
117	0.94 mm
118	0.96 mm
119	0.98 mm
120	1.00 mm
121	1.02 mm
122	1.04 mm
123	1.06 mm
124	1.08 mm

Part no.	Shim thickness
2 430 101 125	1.10 mm
126	1.12 mm
127	1.14 mm
128	1.16 mm
129	1.18 mm
130	1.20 mm
131	1.22 mm
132	1.24 mm
133	1.26 mm
134	1.28 mm
135	1.30 mm
136	1.32 mm
137	1.34 mm
138	1.36 mm
139	1.38 mm

Part no.	Shim thickness
2 430 101 140	1.40 mm
141	1.42 mm
142	1.44 mm
143	1.46 mm
144	1.48 mm
145	1.50 mm
146	1.52 mm
147	1.54 mm
148	1.56 mm
149	1.58 mm
150	1.60 mm
151	1.62 mm
152	1.64 mm
153	1.66 mm
154	1.68 mm

Part no.	Shim thickness
2 430 101 155	1.70 mm
156	1.72 mm
157	1.74 mm
158	1.76 mm
159	1.78 mm
160	1.80 mm
161	1.82 mm
162	1.84 mm
163	1.86 mm
164	1.88 mm
165	1.90 mm
166	1.92 mm
167	1.94 mm
168	1.96 mm
169	1.98 mm

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VE 6/10 F 2400 L 216
(0 460 406 049)

Workshop: EP
05.1989
0165 En

Complaint regarding
"Engine hunting in part load range"
Volvo 780 2.4 Turbo Diesel,
Engine D 24 TIC

If the complaint "Engine hunts in part load range" is encountered with the vehicle mentioned above, an improvement can be achieved by installing the part load governor

1 463 162 025

in place of the part load governor

1 463 161 742

installed as standard up to date of manufacture 852 (12.88).

From date of manufacture 941 (01.89), the part load governor

1 463 162 025

is being installed as standard in the distributor-type fuel-injection pump mentioned above.

The part load governor is to be replaced at cost.

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PE..P..S 7100/7800 Workshop: EP

05.1989

Securing intermediate bearing 0166 En

Loose screws for securing intermediate bearing have resulted in the introduction of a new screw with a different steel quality.
When tightening this screw, proceed as follows:

1. Tighten to torque 8...9 Nm
2. Turn screw a further 90°.

NOTE

The screw is stretched in the process to such an extent that it c a n n o t be used again.

Thus n e w screws are always to be used in the event of repair.

The screws removed from a pump are to be disposed of.

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VE..F..R299
ADJUSTMENT INSTRUCTIONS

Workshop: EP
04.1989
0167 En

Adjustment instructions for:

* Blocking start of delivery in line with piston stroke
* Temperature-dependent idle increase
* Switching valve (for EGR)

Special tools required:

* Setting pin KDEP 1173
* Range spacer KDEP 1176
* Adjusting screw KDEP 1177
* Adjusting gauge KDEP 1175
* Spring tensioner KDEP 1179
* ALDA tester 0 684 200 610 (if available) or Mityvac pump
* Pressure-vacuum tester 0 684 100 701

PREPARING PUMP FOR TESTING:

Remove coupling half (pump component).
Mount drive coupling and altered clamping flange.
Mount injection pump with required test equipment on injection pump test bench.

Mount timing device on pressure side.

Test and adjust according to test instructions W-460/300.
Differing adjustment processes are described below.

ADJUSTING BLOCKING OF START OF DELIVERY IN LINE WITH TO PISTON STROKE

Remove bleeder screw and mount plunger-stroke measuring device KDEP 1085.

Set dial indicator in bottom dead center position of distributor pump plunger to "zero".

Turn pump drive shaft in direction of pump rotation until start of delivery setting value (according to test-specification sheet) referenced to outlet "B" is achieved.
If setting value is exceeded, repeat adjustment process.

Remove support plate of locking screw.
Screw in locking screw and block drive shaft.
Tightening torque of locking screw 27...35 Nm.
Observe setting value with drive shaft blocked.
Remove plunger-stroke measuring device, drive shaft and clean tapered surfaces.
Fit coupling half and fix in position in setting bore with setting pin.
Tighten lock nut to 90...95 Nm.
Do not counter-hold by setting in bore.
Loosen locking screw, mount support plate and tighten to 27...35 Nm.

ADJUSTING TEMPERATURE-CONTROLLED IDLE INCREASE

Screw dir. contr. valve housing (thermocouple holding fixture) into bracket until basic setting dimension 5.3...5.7 mm (distance between bracket and hexagon nut, dir. contr. valve housing) is achieved.

Insert tie rod in intermediate piece.
Position housing-fixed idle spring stop lever against stop for high idle.

Feed clamping piece into tie rod.
Press clamping piece against housing fixed idle spring stop lever and tighten clamping screw to 3.5...4.5 Nm.

ADJUSTING SWITCHING POINT (CONTROL VALVE, EGR)

* Following adjustment process carried out with ALDA tester and pressure-vacuum tester

Pressurize injection pump to 2.5 bar (air pressure).
Connect connecting line from ALDA tester to marked port "1" on control valve.
Connect port "2" with pressure-vacuum tester.

Fit adjusting screw KDEP 1177 between speed control lever and rated speed adjusting screw.

Push range spacer KDEP 1176 with gap measurement 11.8 mm onto third injection quantity stop.
Make up difference with respect to setting dimension 12.0 mm.
Position speed control lever by way of knurled thumbscrew against range spacer.

Note:
Compare setting dimensions/vacuum values with test specification sheet.

Set absolute pressure with control throttle on ALDA tester to 300 hPa.

Mount spring tensioner on bracket.

Insert extension spring in driver on speed control lever.

Screw in knurled nut up to stop and tension extension spring.
The speed control lever is pressed against the range spacer in the process.

Set vacuum to 350 hPa (pressure-vacuum tester display) with adjusting screw (switching valve).

Adjustment process:

In the event of absolute pressure drop, adjust setting value by turning adjusting screw counterclockwise (control valve component screened by anti-tamper device).

Only minimal forces may be applied to the switching valve when doing so.

CHECKING SWITCHING POINT ADJUSTMENT

Place speed control lever against idle stop.
Set pressure-vacuum tester to 600 hPa.

Measurement "1"
* Gap 11.8 mm (set by range spacer).
Insert adjusting screw. Place speed control lever with adjusting screw slightly against range spacer. Insert extension spring in driver on speed control lever. Tension extension spring.
Vacuum value on pressure-vacuum tester 0.0...200 hPa.

Measurement "2":

* Gap 12.1 mm

Make up difference with respect to gap 11.8 mm with feeler gauge and press speed control lever against range spacer under same conditions as with measurement "1".

Vacuum value on pressure-vacuum tester 600 hPa.

If vacuum values are not achieved, test angle of stop bracket.

ADJUSTING SWITCHING POINT

* Following adjustment process carried out with Mityvac pump

Connect Mityvac pump to port "1" on control valve.
Connect port "2" with pressure-vacuum tester.
Pressurize injection pump to 2.5 bar (air pressure).
Insert adjusting screw.
Push range spacer with gap 11.8 mm onto third injected quantity stop.
Make up difference with respect to setting dimension 12.0 mm.
Mount spring tensioner on bracket.
Insert extension spring in driver on speed control lever.

Screw in knurled thumbscrew up to stop and tension extension spring.
Actuate Mityvac pump until a vacuum of approx. 800 hPa is achieved on pressure-vacuum tester.
Set vacuum to 350 hPa (pressure-vacuum tester display) with adjusting screw (switching valve).
Adjustment process:
Adjust setting value by turning adjusting screw counterclockwise (control valve component screened by anti-tamper device).
Only minimal forces may be applied to the switching valve. Ventilate pressure-vacuum tester and Mityvac pump after adjustment process.

CHECKING SWITCHING POINT ADJUSTMENT

Measurement "1":
* Gap 11.8 mm
  (set by range spacer)

Insert adjusting screw.
Place speed control lever with adjusting screw slightly against range spacer.
Insert extension spring in driver on speed control lever.
Tension extension spring.
Pressurize control valve with vacuum.
Vacuum value on pressure-vacuum tester 0.0...200 hPa.

Measurement "2":

* Gap 12.1 mm

Make up difference with respect to from gap 11.8 mm with feeler gauge and press speed control lever against range spacer under same conditions as with measurement "1".
Pressurize control valve with vacuum.

Vacuum value on pressure-vacuum tester 600 hPa.

If vacuum values are not reached, test angle of stop bracket.

TESTING AND ADJUSTING ANGLE

Remove switching valve.

Insert adjusting screw between speed control lever and rated speed adjusting screw.
Push range spacer onto third injected quantity stop.

Make up difference with respect to setting dimension 12.0 mm.
Place speed control lever with knurled thumbscrew against range spacer.

Mount calibration arm in place of switching valve and test angle of stop bracket.

If adjusting gauge cannot be inserted, adjust stop bracket.

Loosen hexagon nut of stop bracket and turn stop bracket.
Remove adjusting gauge.

Mount switching valve and repeat switching point adjustment.

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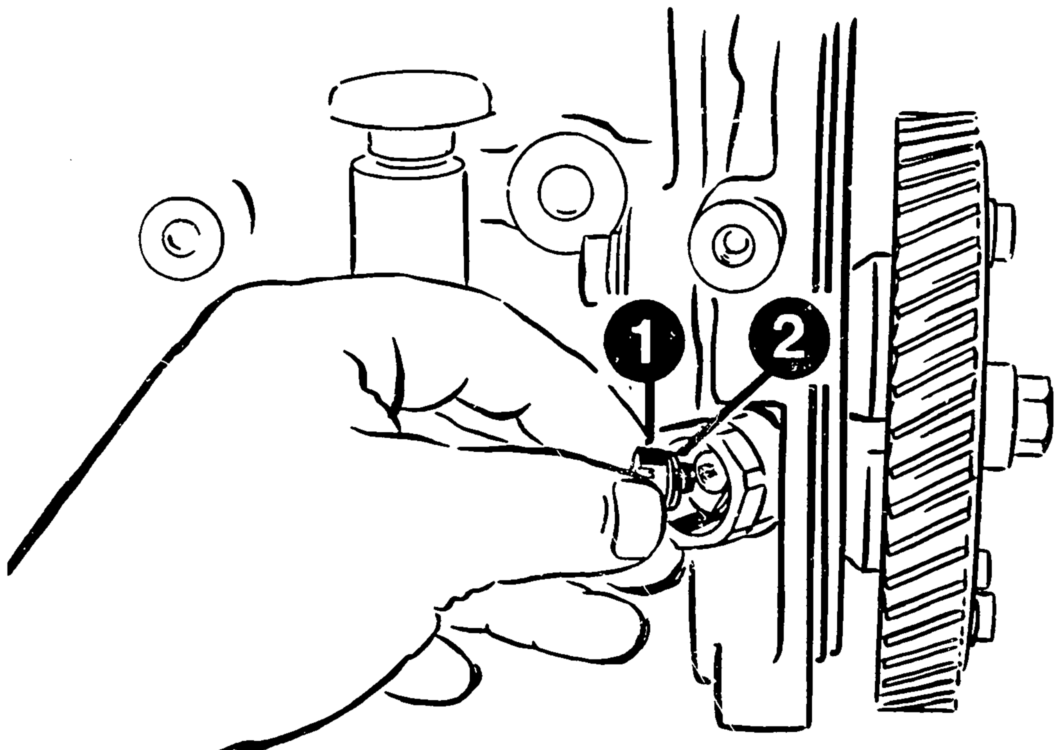
PES 6 P..
PUMP ASSEMBLIES
for Ford and Caterpillar
Installation and
adjustment instructions

Workshop: EP
12.1989
0169 En

Special features of numerous injection-pump assemblies on Ford and Caterpillar engines are an electromagnetic shutoff device, an intermediate flange with blocking device and an adjustable toothed gear.

DISASSEMBLY OF INJECTION—PUMP ASSEMBLY

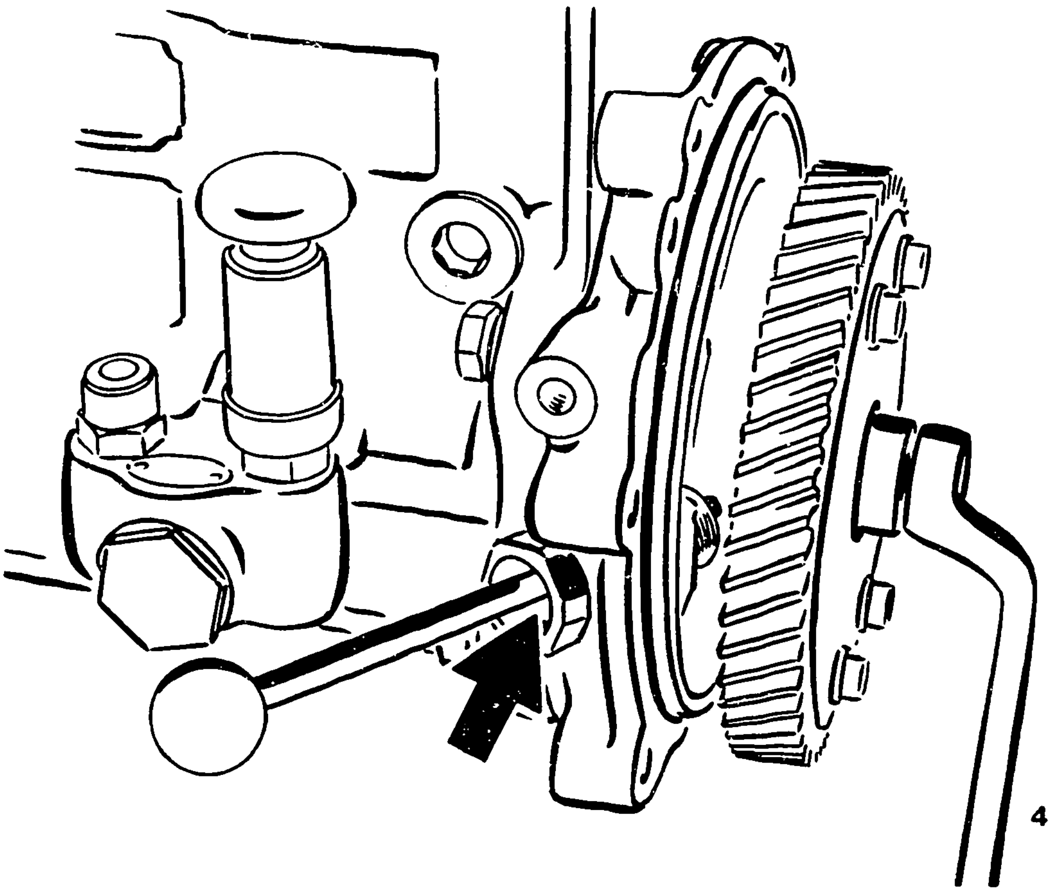
Clamp injection—pump assembly with bracket of shutoff solenoid in vice.
Loosen and unscrew screw plug (1).
Remove seal ring (2).



400/102

Insert setting mandrel KDEP 1638 into hole in eccentric bush (arrow).
Turn camshaft at drive toothed gear until setting mandrel engages in slot in toothed gear hub.

Loosen and unscrew fastening nut of toothed gear.
Remove setting mandrel.


400/103

Use extractor KDEP 2918 to detach toothed gear from camshaft. Loosen and unscrew fastening screws of intermediate flange. Remove intermediate flange.
Disconnect ball socket of linkage from shutoff solenoid at stop lever.
Unscrew fuel-injection pump from bracket of shutoff solenoid.
Attach injection-pump assembly to clamping support KDEP 2919 and continue disassembly as prescribed.

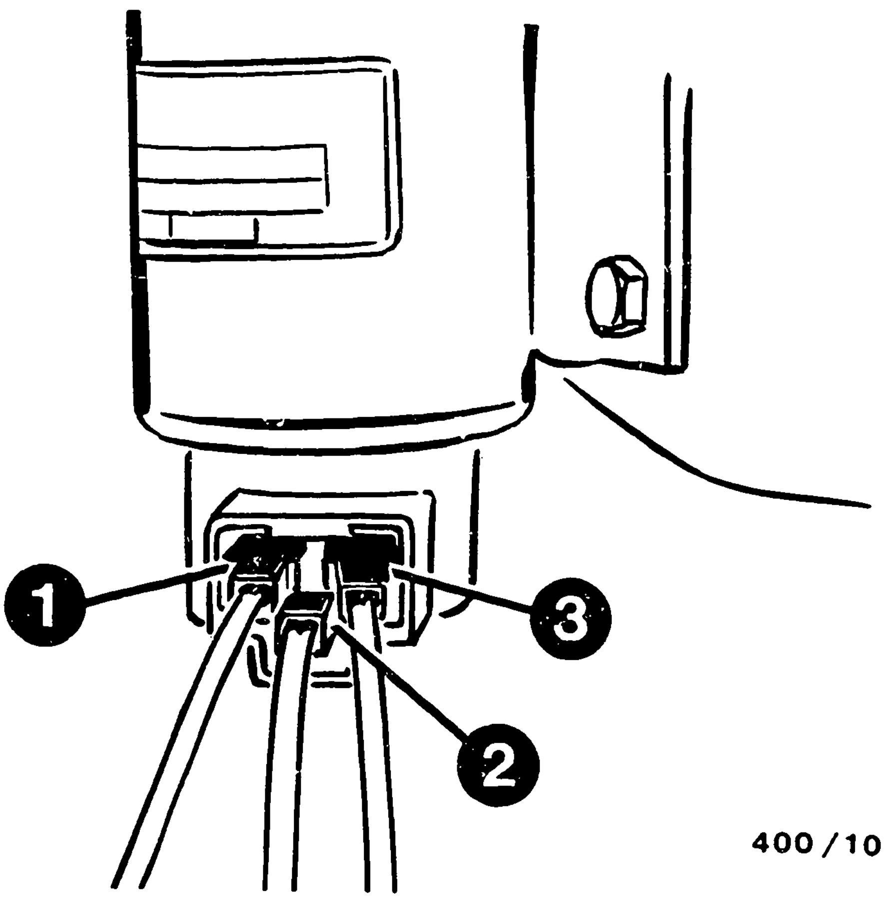
For adjustment purposes, clamp injection-pump assembly without shutoff solenoid, supply pump, intermediate flange and toothed gear to injection-pump test bench.

Set prestroke and angular cam spacing.
Note down actual value for prestroke of barrel 1 of fuel-injection pump.
Carry out further adjustment of injection-pump assembly in usual manner in accordance with test specifications.
Set stop screw of stop lever such that control rod has 1.5...2.0 mm travel when stop lever is actuated.
Detach pump with attached control-rod-travel measuring device from injection-pump test bench.

FUNCTION OF ELECTROMAGNETIC SHUT OFF DEVICE

The shutoff solenoid features a pull-in winding and a holding winding.
The plug connection thus consists of three connections:

1 = Connection for holding winding
2 = Connection for pull-in winding
3 = Ground connection



400/104

Switching on the vehicle electrical system likewise connects the shut off device. This causes the engagement coil to move the stop lever of the governor into the operating position via the connecting linkage. As the holding winding is constantly supplied with voltage during operation of the engine, the stop lever remains in the operating position. When the vehicle electrical system is switched off, the shutoff solenoid is deenergized and the linkage moves the stop lever into the stop position. This means that the control rod of the fuel-injection pump is retracted to stop and the engine is switched off.

Attach bracket of shut off device to fuel-injection pump. Fit shut off device and clamp injection-pump assembly into vice at bracket.

Adjustment:
Move control rod to start position by moving stop lever appropriately and then pull back again by 1 mm. Secure stop lever in this position.
Loosen lock nut of ball socket of connecting linkage and turn ball socket until it can be attached to the ball stud of the stop lever.
Tighten lock nut again.

ELECTRICAL TESTING OF SOLENOID:

Use is to be made as voltage source of a 12 volt battery (cut-in current of solenoid = 37 A).
Connect ground connection to negative terminal of battery. Then simultaneously connect holding winding and pull-in winding to positive terminal of battery; the shut off device pulls the stop lever into the operating position. After 3 seconds at the latest, interrupt connection to pull-in winding and only maintain connection to holding winding. Stop lever must remain in operating position.

In the event of malfunctions, measure the resistance values with a multimeter and replace the shutoff solenoid if necessary.

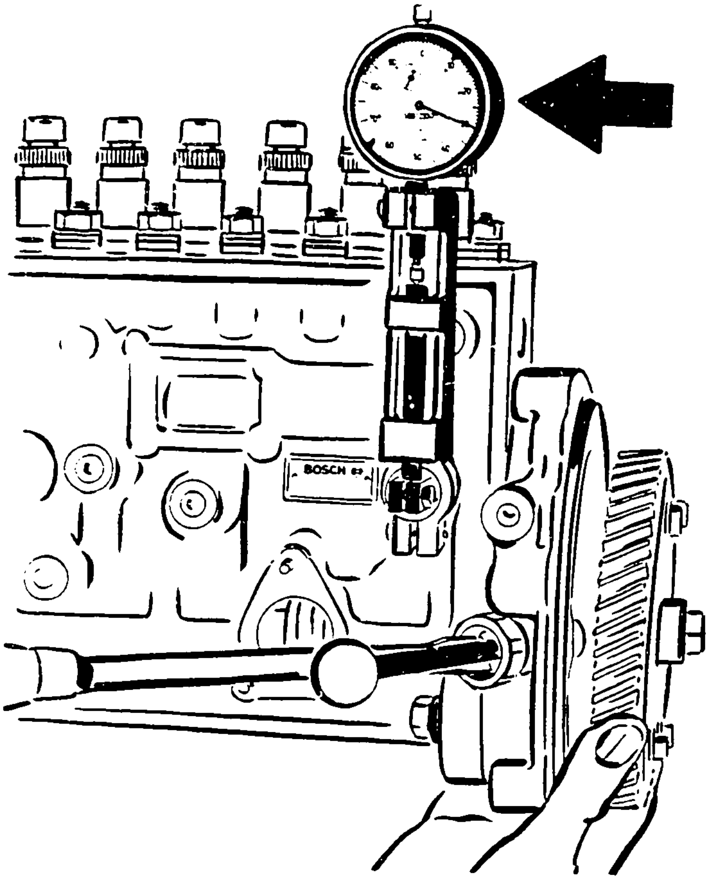
Test specifications for resistance measurement:

Pull-in winding:	approx. 14.6 ohms
Holding winding:	approx. 0.2 ohms

Detach control-rod-travel measuring device and screw screw plug with seal ring into pump housing.

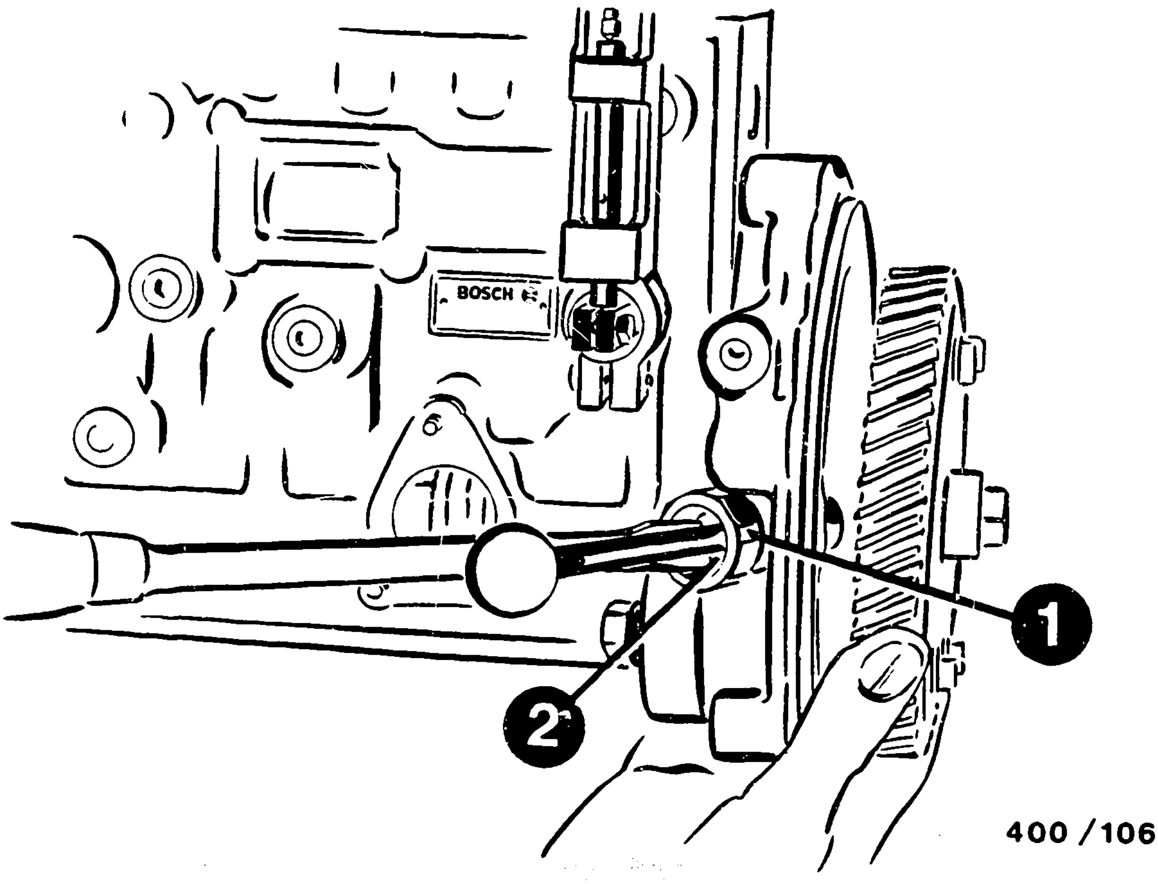
ASSEMBLY OF INTERMEDIATE FLANGE AND ADJUSTMENT OF BLOCKING DEVICE

Remove coupling half from camshaft. Attach intermediate flange with appropriate screws to flange of pump housing.
Attach drive toothed gear to tapered part of camshaft. Attach prestroke measuring device and turn camshaft in prescribed direction until noted prestroke value is displayed by the dial indicator (arrow).



400/105

Insert setting mandrel KDEP 1638 into slot of toothed gear hub. If this is not possible, loosen nut (1) and turn eccentric bush (2) until blocking device can be inserted into slot of hub. Tighten lock nut (1) again. Tighten fastening nut for drive toothed gear to 150...170 Nm. Remove setting mandrel KDEP 1638 from eccentric bush and screw screw plug with new seal ring into eccentric bush. Unclamp injection-pump assembly and attach to engine.



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TESTING OF NOZZLE-AND-HOLDER ASSEMBLIES

Workshop: EP
07.1989
0176 En

The testing of nozzle-and-holder assemblies is described in the Workshop Microcard "Instructions for the Repair and Testing of Nozzle-and-Holder Assemblies" (refer to Index Microcard W-400/000).

There have recently been an increased number of wrong assessments on performance of incoming inspection.

The following were incorrectly assessed:

* Leakage
* Spray pattern
* Chatter

In order to achieve more reliable assessment, in particular in the case of warranty assessment, the nozzle-and-holder assemblies must be cleaned before carrying out testing.

The previously prescribed nozzle cleaning method using a brass brush is no longer sufficient.

Cleaning in an ultrasonic bath creates the prerequisite for correct nozzle testing (see below for equipment recommendation).

TEST INFORMATION

Further testing is not necessary if visual inspection already shows nozzles to be damaged (e.g. broken pintle).

Nozzles cleaned in an ultrasonic cleaning bath are to be examined in line with the same test criteria as those prescribed in the Workshop Microcard "Repair and Testing of Nozzle-and-Holder Assemblies" (see Index Microcard W-400/000).

Particular attention is to be paid to the following:

As regards their spray pattern, flat-type pintle nozzles are to be assessed differently to throttling pintle nozzles. They exhibit a one-sided, oval spray pattern.

Nozzles designated e.g. DN 12.. (12 degrees spray-dispersal angle) are to be assessed differently to DN 0.. (0 degrees spray-dispersal angle). The spray is only a closed spray with DN 0..

Assessment of freedom from leaks together with chatter testing and/or spray testing is not permitted.

When testing chatter behaviour, the differing prescribed test speeds for used and new nozzles are to be observed.

The characteristic chatter group of a hole-type nozzle to be tested is to be taken from the new test-specification microcard WP-430.

REPAIR

When repairing (disassembling/assembling) nozzle-and-holder assemblies, neither nozzles nor parts of the nozzle-holder assemblies may be lapped, cleaned with an emery cloth/steel brushes or machined.

Furthermore, it is to be ensured that the nozzle body and needle valve of a nozzle remain assigned to one another and that they are not mixed up with parts of other nozzles.

This applies in particular to nozzles which have been sent in for warranty assessment on account of complaints received (not bulk goods).

Nozzles/nozzle-and-holder assemblies and component parts can no longer be examined at BOSCH if they have not been cleaned using ultrasonic cleaning methods.

CLEANING OF NOZZLES/NOZZLE-AND-HOLDER ASSEMBLIES PRIOR TO TESTING

All parts must be cleaned before mounting nozzle-and-holder assemblies. Sealing surfaces must not be damaged. Damaged parts are to be replaced by new ones.

ULTRASONIC CLEANING

For ultrasonic cleaning purposes, we recommend an ultrasonic cleaning unit with basket and lid as well as an alkaline cleaning agent.

We recommend for example the following ultrasonic cleaning unit:

* For After-Sales-Service Workshops in Germany:

  - Cleaning unit
    SONOREX SUPER RK 102 H

  - Basket (part no. 353 K 3)
  - Basket (part no. 370 KD 0)
  - Lid (part no. 343 D 38)

  as manufactured by
  BANDELIN electronic
  Postfach 45 01 60
  1000 Berlin 45 (West).

The following is recommended for example as cleaning agent:

Neodisher LM10

as manufactured by
Dr. Weigert GmbH
Chemische Fabrik
Postfach 28 01 27
2000 Hamburg 28.

* After-Sales-Service Workshops outside Germany can also make use of domestically available equipment and cleaning agents.

The following usage instructions are to be observed:

1. Use is to be made of acid-resistant gloves and goggles.
2. The cleaning fluid is to be diluted with water in a volumetric ratio of 1:20.
3. Warm up cleaning bath to approx. 45 degrees C.
4. Place nozzle-and-holder assembly as vertically as possible in basket with nozzle facing downwards.
5. Duration of cleaning in line with level of contamination, however at least 10 minutes.

6. Rinse parts in cold cleanser immediately after cleaning; then blow dry with compressed air and immerse in test oil.

7. The nozzle-and-holder assembly is then to be rinsed out on a manual test bench.

8. When cleaning nozzles, pull needle completely out of body and clean both parts separately. In doing so, the nozzle body is to be cleaned as vertically as possible with the holes facing downwards. Cleaning time at least 5 minutes.

9. Care is to be taken to ensure that needle and body are not mixed up with parts of other nozzles. Subsequent treatment as described under item 6.

10. Change cleaning fluid as required. Given heavily contaminated nozzle-and-holder assemblies, one fill is sufficient for between approx. 15 and 20 nozzle-and-holder assemblies and 10 - 15 nozzles.

11. Disposal:

Neutralize if appropriate facilities available. If no neutralization system is available, used cleaning fluid must be disposed of as special refuse by an approved specialist company (waste code number is indicated on safety data sheet).

The respective waste disposal regulations apply to countries outside West Germany.

12. Safety data sheet:
Attention is to be paid to the corresponding safety data sheet prior to utilizing the cleaning agent.

Extract from safety data sheet:

Chemical characterization:
Highly-alkaline cleaner on potassium-hydroxide base with phosphate additives as corrosion inhibitors.
Never mix with strong acids!

First aid:

Eyes and skin:
Rinse out with copious amounts of water and go to doctor.

There is a danger of serious injury in the event of lengthy exposure to skin and eyes!

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SAAB-SCANIA
Discolored nozzles
Diagnostic
instructions

Motor vehicle: FZD
and workshop: EP
09.1989
0186 En

Recently, there have been reports – particularly in South America – of blue discolored nozzles specially at the nozzle tip.

This discoloration at the tip is due to a combination of altitude and exposure to high combustion temperatures.

Investigations have shown that blue tarnished nozzles do not have a nagative affect on the function of nozzle or the holder assemblies.

Nozzle-and-holder assemblies can in any case only be assessed by checking them on a nozzle tester following careful cleaning (where possible using ultrasonic means). In doing so, a check is to be made on all four test criteria

* opening pressure
* chatter
* leakage
* spray pattern.

If this test reveals no defects, the nozzles can still be used even if discolored, (i.e. requests for warranty are to be denied).

Note: If the opening pressure is below the rated value, the pressure is to be adjusted in the normal manner. When carrying out further checking of the re-adjusted nozzle-and-holder assemblies, it is to be noted that the characteristic chatter group of new nozzles is not to be taken as an assessment criterion. When the lever is actuated quickly, the nozzle must chatter (possibly high-pitch whistling tone) o r provide a thoroughly atomized spray.

Nozzles, which do not satisfy these criteria following re-adjustment of the opening pressure, are to be replaced with new ones.

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IN-LINE PUMPS
OF TYPE
P ... S 7000/7100/7800

Workshop: EP
10.1989
0197 En

Damaged
high-pressure seal

There have been individual instances of high-pressure seals 2 410 105 005 (seals between delivery-valve assembly and plunger-and-barrel assembly) breaking.

This special fault is not contained in the fault number list in the warranty manual.

In order to obtain further field experience, we would ask you until further notice to report this fault in warranty situations together with the usual warranty data with fault number 20 and in plain language "delivery-valve-assembly gasket broken".
These service instructions will be revoked by way of deletion from the index of valid Service Infos (W-400/000).

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(KH/VKD 2)
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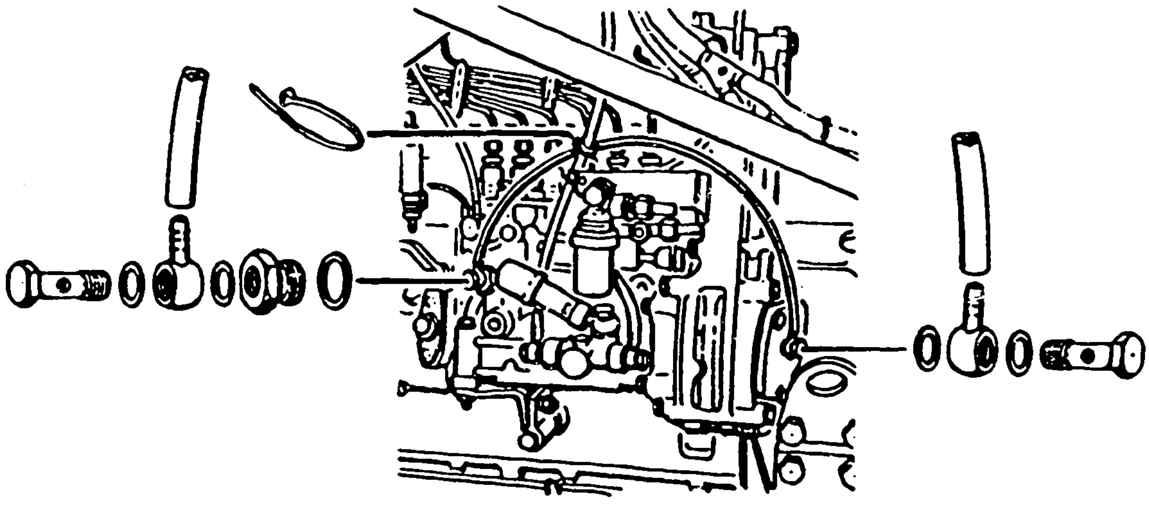
MAN ENGINE
D 2866 LXF
with PES 6P 120A
720/3 LS 3205

Motor vehicle: FZD
and workshop: EP
10.1989
0193 En

We would like to inform you about the following changes to the lubricating-oil supply of the injection-pump assembly 0 402 036 726 and .. 727.

1. A vent line (see illustration below) with the MAN part number 81 12320.6004 is currently being retrofitted as an after-sales service solution by MAN Service Workshops.



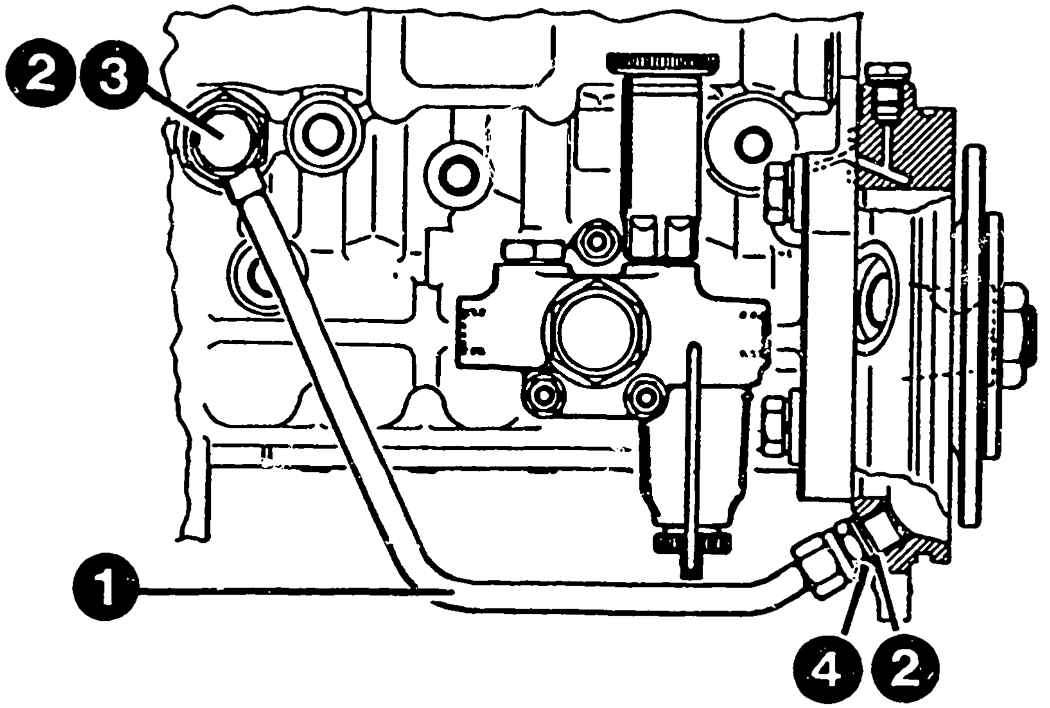
400/109

This line is designed to provide pressure compensation between fuel-injection pump and engine crankcase.

If you find this line when performing service work, it must be left as shown in the illustration.

2. The fuel-injection pumps have been modified as of MDC 945 (May 1989) in series production (see picture below).

In this process, use is made of a drive-end bearing end plate without oil return bores and a modified intermediate flange.



400/110

Description	
Bearing end plate	Part number, old: 2 415 551 097 Part number, new: 2 415 551 102
Intermediate flange	Part number, old: 2 415 703 034 Part number, new: 2 415 703 035

The component items 1, 2, 3 and 4 are MAN parts with the following part number:

Item 1

Description: Oil return line
Quantity: 1
Part number: 51.05702.5587

Item 2

Description: Seal ring A14x20 Cu DIN 7603
Quantity: 3
Part number: 06.56190.0706

Item 3

Description: Reducer bushing
M14x1.5 10-DIN 7643
Quantity: 1
Part number: 06.78340.0106

Item 4

Description: Union
CL 10-St DIN 2353
Quantity: 1
Part number: 06.71010.0307

The modification was introduced at MAN as of engine no. xxx 6011050 xxxx.

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)

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CROSS REFERENCE
EXPERIMENTAL TO
RELEASED PARTS
CESIGNATION

Motor vehicle: FZD
and Workshop: EP
11.1989
0190 En

BOSCH <==> Cummins/Case

When servicing the following experimental injection pumps, the parts list and test specifications of the released version can be utilized.

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

---

1. VE 4/12F 1250 RV 5019
2. 0 460 424 006
3. VE 4/12F 1250 R 123
4. 390 - 3354

1. VE 4/12F 1150 RV 5020
2. 0 460 424 008
3. VE 4/12F 1150 R 123-2
4. 390 - 3355

1. VE 4/12F 1100 RV 5021
2. 0 460 424 007
3. VE 4/12F 1100 R 123-1
4. 390 - 3356

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

1. VE 4/12F 1150 RV 5022
2. 0 460 424 010
3. VE 4/12F 1050 R 123-4
4. 390 - 3357

1. VE 4/12F 1100 RV 5025
2. 0 460 424 011
3. VE 4/12F 1100 R 123-5
4. 390 - 3360

1. VE 4/12F 1050 RV 5041
2. 0 460 424 012
3. VE 4/12F 1050 R 123-6
4. 390 - 3390

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

1. VE 4/12F 1400 RV 5064
2. 0 460 424 015
3. VE 4/12F 1050 R 182
4. 390 - 3353

1. VE 4/12F 1100 RV 5078
2. 0 460 424 021
3. VE 4/12F 1100 R 123-12
4. 390 - 6318

1. VE 4/12F 1050 RV 5079
2. 0 460 424 020
3. VE 4/12F 1050 R 123-11
4. 390 - 6319

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 4/12F 1250 RV 5098
2. 0 460 424 019
3. VE 4/12F 1250 R 123-10
4. 390 - 6316

1. VE 4/12F 1250 RV 5110
2. 0 460 424 016
3. VE 4/12F 1250 R 182-1
4. 390 - 6631

1. VE 4/12F 1250 RV 5144
2. 0 460 424 024
3. VE 4/12F 1250 R 226-2
4. 390 - 8183

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 4/12F 1400 RV 5173
2. 0 460 424 026
3. VE 4/12F 1400 R 230
4. 390 - 8182

1. VE 4/12F 1150 RV 5178
2. 0 460 424 023
3. VE 4/12F 1150 R 226-1
4. 390 - 8184

1. VE 4/12F 1100 RV 5179
2. 0 460 424 022
3. VE 4/12F 1100 R 226
4. 390 - 8185

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 4/12F 1050 RV 5180
2. 0 460 424 025
3. VE 4/12F 1050 R 226-3
4. 390 - 8186

1. VE 4/12F 1250 RV 5181
2. 0 460 424 034
3. VE 4/12F 1250 R 226-4
4. 390 - 7151

1. VE 4/12F 1250 RV 5187
2. 0 460 424 027
3. VE 4/12F 1250 R 130-1
4. 390 - 8191

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 4/12F 1250 RV 5204
2. 0 460 424 028
3. VE 4/12F 1250 R 231
4. 390 - 8195

1. VE 4/12F 1150 RV 5205
2. 0 460 424 029
3. VE 4/12F 1150 R 231-1
4. 390 - 9590

1. VE 4/12F 1100 RV 5206
2. 0 460 424 032
3. VE 4/12F 1100 R 230-2
4. 390 - 8196

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

1. VE 4/12F 1050 RV 5207
2. 0 460 424 033
3. VE 4/12F 1050 R 230-3
4. 390 - 9592

1. VE 4/12F 1250 RV 5210
2. 0 460 424 030
3. VE 4/12F 1250 R 239
4. 390 - 7649

1. VE 4/12F 1400 RV 5217
2. 0 460 424 051
3. VE 4/12F 1400 R 239-2
4. 390 - 6323

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

1. VE 4/12F 1250 RV 5225
2. 0 460 424 031
3. VE 4/12F 1250 R 239-1
4. 390 - 9592

1. VE 4/12F 1400 RV 5233
2. 0 460 424 051
3. VE 4/12F 1400 R 239-2
4. 390 - 7649

1. VE 4/12F 1100 RV 5276
2. 0 460 424 043
3. VE 4/12F 1100 R 310-1
4. 391 - 2111

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 4/12F 1100 RV 5280
2. 0 460 424 042
3. VE 4/12F 1100 R 310
4. 391 - 1190

1. VE 4/12F 1250 RV 5298
2. 0 460 424 045
3. VE 4/12F 1250 R 301-1
4. 391 - 1242

1. VE 4/12F 1250 RV 5303
2. 0 460 424 041
3. VE 4/12F 1250 R 301
4. 391 - 1240

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1150 RV 5028
2. 0 460 426 043
3. VE 6/12F 1150 R 159-3
4. 390 - 3365

1. VE 6/12F 1100 RV 5029
2. 0 460 426 042
3. VE 6/12F 1100 R 159-2
4. 390 - 3366

1. VE 6/12F 1050 RV 5030
2. 0 460 426 044
3. VE 6/12F 1050 R 159-4
4. 390 - 3367

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1100 RV 5033
2. 0 460 426 049
3. VE 6/12F 1100 R 159-7
4. 390 - 3370

1. VE 6/12F 1250 RV 5034
2. 0 460 426 045
3. VE 6/12F 1250 R 159-5
4. 390 - 4539

1. VE 6/12F 1100 RV 5035
2. 0 460 426 050
3. VE 6/12F 1100 R 159-8
4. 390 - 4536

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1325 RV 5042
2. 0 460 426 054
3. VE 6/12F 1325 R 173-2
4. 390 - 3373

1. VE 6/12F 1050 RV 5053
2. 0 460 426 055
3. VE 6/12F 1050 R 159-12
4. 390 - 4535

1. VE 6/12F 1000 RV 5056
2. 0 460 426 053
3. VE 6/12F 1000 R 159-11
4. 390 - 4540

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1400 RV 5062
2. 0 460 426 038
3. VE 6/12F 1400 R 173
4. 390 - 3363

1. VE 6/12F 1250 RV 5063
2. 0 460 426 035
3. VE 6/12F 1250 R 159
4. 390 - 3364

1. VE 6/12F 1250 RV 5072
2. 0 460 426 046
3. VE 6/12F 1250 R 173-1
4. 390 - 4980

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1250 RV 5073
2. 0 460 426 041
3. VE 6/12F 1250 R 159-1
4. 390 - 4543

1. VE 6/12F 1050 RV 5074
2. 0 460 426 047
3. VE 6/12F 1050 R 159-6
4. 390 - 4537

1. VE 6/12F 1100 RV 5075
2. 0 460 426 051
3. VE 6/12F 1100 R 159-9
4. 390 - 4538

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1200 RV 5086
2. 0 460 426 056
3. VE 6/12F 1200 R 159-13
4. 390 - 6459

1. VE 6/12F 1100 RV 5097
2. 0 460 426 057
3. VE 6/12F 1100 R 159-14
4. 390 - 6458

1. VE 6/12F 1050 RV 5135
2. 0 460 426 058
3. VE 6/12F 1050 R 173-3
4. 390 - 4544

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1250 RV 5145
2. 0 460 426 060
3. VE 6/12F 1250 R 173-4
4. 390 - 8219

1. VE 6/12F 1150 RV 5150
2. 0 460 426 071
3. VE 6/12F 1150 R 225-4
4. 390 - 8199

1. VE 6/12F 1100 RV 5160
2. 0 460 426 067
3. VE 6/12F 1100 R 225
4. 390 - 8200

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1100 RV 5160
2. 0 460 426 067
3. VE 6/12F 1100 R 225
4. 391 - 0251

1. VE 6/12F 1100 RV 5160-1
2. 0 460 426 067
3. VE 6/12F 1100 R 225
4. 391 - 0251

1. VE 6/12F 1150 RV 5163
2. 0 460 426 086
3. VE 6/12F 1150 R 173-5
4. 390 - 4726

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1050 RV 5165
2. 0 460 426 087
3. VE 6/12F 1050 R 173-6
4. 390 - 4728

1. VE 6/12F 1200 RV 5176
2. 0 460 426 073
3. VE 6/12F 1200 R 225-6
4. 390 - 8216

1. VE 6/12F 1400 RV 5194
2. 0 460 426 077
3. VE 6/12F 1400 R 232
4. 390 - 8197

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1400 RV 5195
2. 0 460 426 064
3. VE 6/12F 1400 R 159-15
4. 390 - 8212

1. VE 6/12F 1000 RV 5197
2. 0 460 426 080
3. VE 6/12F 1000 R 225-11
4. 390 - 8211

1. VE 6/12F 1250 RV 5198
2. 0 460 426 078
3. VE 6/12F 1250 R 232-11
4. 390 - 8215

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1250 RV 5199
2. 0 460 426 066
3. VE 6/12F 1250 R 159-16
4. 390 - 8198

1. VE 6/12F 1100 RV 5200
2. 0 460 426 075
3. VE 6/12F 1100 R 225-9
4. 390 - 8207

1. VE 6/12F 1250 RV 5209
2. 0 460 426 059
3. VE 6/12F 1250 R 195
4. 390 - 7556

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1325 RV 5212
2. 0 460 426 063
3. VE 6/12F 1325 R 198
4. 390 - 8217

1. VE 6/12F 1100 RV 5213
2. 0 460 426 082
3. VE 6/12F 1100 R 225-13
4. 390 - 8209

1. VE 6/12F 1250 RV 5214
2. 0 460 426 092
3. VE 6/12F 1250 R 225-14
4. 390 - 8210

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1050 RV 5228
2. 0 460 426 076
3. VE 6/12F 1050 R 225-10
4. 390 - 8208

1. VE 6/12F 1250 RV 5241
2. 0 460 426 059
3. VE 6/12F 1250 R 195
4. 390 - 7556

1. VE 6/12F 1250 RV 5242
2. 0 460 426 091
3. VE 6/12F 1250 R 195-1
4. 390 - 7648

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1400 RV 5265
2. 0 460 426 108
3. VE 6/12F 1400 R 195-2
4. 390 - 4732

1. VE 6/12F 1100 RV 5270
2. 0 460 426 118
3. VE 6/12F 1100 R 225-17
4. 391 - 2126

1. VE 6/12F 1100 RV 5275
2. 0 460 426 106
3. VE 6/12F 1100 R 296-1
4. 391 - 2133

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1250 RV 5282
2. 0 460 426 110
3. VE 6/12F 1250 R 304
4. 391 - 1238

1. VE 6/12F 1250 RV 5290
2. 0 460 426 103
3. VE 6/12F 1250 R 278
4. 391 - 0769

1. VE 6/12F 1050 RV 5294
2. 0 460 426 125
3. VE 6/12F 1050 R 173-11
4. 391 - 0792

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1400 RV 5297
2. 0 460 426 124
3. VE 6/12F 1400 R 195-5
4. 391 - 2831

1. VE 6/12F 1300 RV 5305
2. 0 460 426 122
3. VE 6/12F 1300 R 195-3
4. 391 - 2827

1. VE 6/12F 1400 RV 5306
2. 0 460 426 123
3. VE 6/12F 1400 R 195-41
4. 391 - 2833

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

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1. VE 6/12F 1100 RV 5314-1
2. 0 460 426 118
3. VE 6/12F 1100 R 335-17
4. 391 - 2126

1. VE 6/12F 1250 RV 5318
2. 0 460 426 110
3. VE 6/12F 1250 R 304
4. 391 - 1238

1. VE 6/12F 1250 RV 5320
2. 0 460 426 103
3. VE 6/12F 1250 R 278
4. 391 - 0769

1= Experimental BOSCH Parts Designation
2= Released BOSCH Part Number
3= Released BOSCH Parts Designation
4= Cummins/Case Part Number

1. VE 6/12F 1100 RV 10902
2. 0 460 426 113
3. VE 6/12F 1100 R 173-10
4. 391 - 2113

This cross reference will be updated as further information becomes available.

ROBERT BOSCH Corporation
Service Department
Automotive & Diesel Products
(UA/ASV)

Please direkt questions and comments concerning the contents to our authorized representative in your country.

When performing service on the subject injection pumps, you may encounter various shut-off system configurations which are not found in the parts list.

The reason for this is, that the end user of dealer has modified (with factory approval) the shut-off system configuration to meet individual requirements without change to the Cummins or Bosch part number.
In these cases, the components (solenoid, etc.) must be serviced as received, not as listed in the parts list.

In order for you to service these units better and make modifications as per end user requirements possible, we are listing all current shut-off configurations, including the part numbers of the main components:

1. MECHANICAL SHUT-OFF:

Replace solenoid with plug and "O" ring as listed below:

Cummins Kit No. 391 5293

1 463 462 301	Plug
1 460 210 006	"O"Ring

Verify function of mechanical shut-off on test stand by operating injection pump at rated speed with the control lever at full load, then operate shut-off lever.
Fuel delivery must not exceed 3.0 cm3/1000 strokes

2. ENERGIZE TO SHUT-OFF:

Install solenoid with plunger return spring and "O" ring listed below:

12 VOLT

Cummins Kit No. 390 5130

0 330 106 010	Solenoid
1 464 612 304	Plunger Return Spring
1 460 210 006	"O" Ring

24 VOLT

Cummins Kit No. 390 5131

0 330 106 012	Solenoid
1 464 612 304	Plunger Return Spring
1 460 210 006	"O" Ring

Verify function of shut-off solenoid on test stand by operating injection pump at rated speed.

With 12V/24V applied to solenoid, fuel delivery must cease.

3. ENERGIZE TO RUN:

Install solenoid with plunger return spring and "O" ring listed below:

12 VOLT

0 330 001 015	Solenoid
1 460 210 006	"O" Ring

24 VOLT

0 330 001 016	Solenoid
1 460 210 006	"O" Ring

Verify shut-off solenoid function on test stand by operating injection pump at low idle speed.

With 0 (zero) volts applied, fuel delivery must not exceed 3,0 cm/1000 strokes.
Minimum cut-in voltage ist 10V/22V

Standard warranty for Cummins applies.

Any modifications requested by the customer are on a charge basis.

ROBERT BOSCH Corporation
Service Department
Automotive & Diesel Products
(UA/ASV)

Please direkt questions and comments concerning the contents to our authorized representative in your country.

F O R D
TRANSIT 2.5 L DI
with distr.-type
fuel-inj.pumps
VE..F..R288 ..-1 , ..-2 , ..-3
0 460 414 051,..052,..055,..062

Motor vehicle: FZD
and workshop: EP
10.1989
0196 En

Complaint regarding "lack of performance"

If, with the above-mentioned vehicle, the complaint "lack of performance" is encountered, the following modifications:

* Start-of-delivery blocking

* Sleeve-starting travel

can bring about an improvement.

Lack of performance may also be caused by a loose sliding bolt in the HBA housing.

MODIFICATIONS

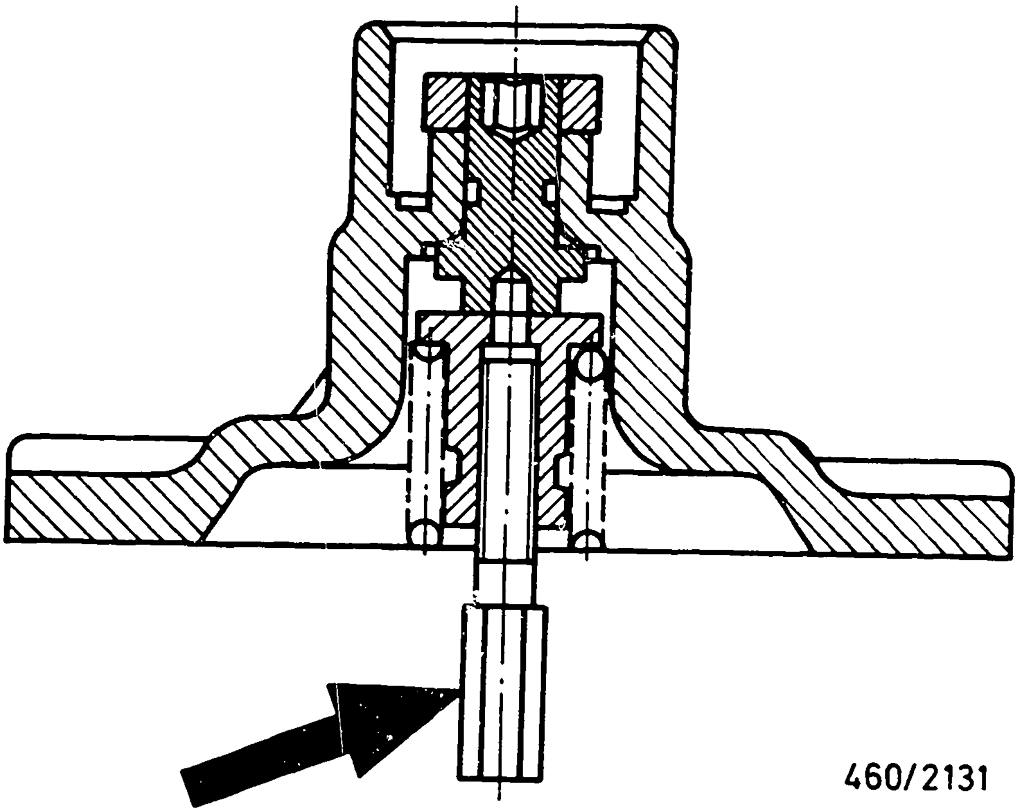
* Start-of-delivery blocking as of date of manufacture "941" changed from 0.55 mm to 0.78 mm plunger stroke
* Sleeve-starting travel (MS dimension) changed from 1.0...1.4 mm to 1.3...1.7 mm

CALIBRATION WORK

Loose sliding bolt (arrow) in HBA housing.

* Calibrate HBA stroke in accordance with test-specification sheet (quoted in Section on deliveries and breakaway characteristics).

Remove fuel-injection pump and set down on injection-pump test bench as described in test instructions "VE..F.. with HBA and switching point adjustment" (see documentation microcard W-400/000).



460/2131

Published by:

Robert Bosch GmbH
Division KH
After-Sales-Service Department for
Training and Technology (KH/VSK)

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CONVERSION OF FUEL-
INJECTION PUMPS

Workshop: EP
11.1989
0202 En

Fuel-injection pumps
PE 8 P 110 A 320 LS 38 ..
in Kässbohrer buses

If, on repairing these fuel-injection pumps, it is established that wear or a defect has resulted from an inadequate supply of lubricating oil, the fuel-injection pumps are to be converted to the version with inclined-running capability and the necessary on-the-engine modification is to be implemented.

MODIFICATION OF FUEL-INJECTION PUMP

The bearing end plate of the fuel-injection pump is to be modified as follows:

Fuel-injection pump: PE 8 P 110 A 320 LS 3802
.. LS 3807
.. LS 3811

Bearing end plate: old: 2 415 551 072

new: 2 415 551 073

Fuel-injection pump: PE 8 P 110 A 320 LS 3802-10
.. LS 3807-10
.. LS 3811-10

Bearing end plate: old: 2 415 551 078

new: 2 415 551 077

Furthermore, the screw plug 2 413 461 000 (prestroke boss) is to be replaced on all versions by the inlet-union screw 2 413 462 016.

As of engine serial end numbers ...
125 825, injection-pump versions with
inclined-running capability have
already been fitted.

PE 8 P 110 A 320	LS 3813-10
PE 8 P 120 A 320	LS 3811-11
..	LS 3816-10

Engine modification

An oil return line is to be routed from the prestroke boss of the fuel-injection pump to the engine control housing cover.

Parts required:	Kässbohrer service part no.:
Oil return line:	8.311.999.944
Cover:	8.311.999.817
Inlet-union screw (2 x):	6.096.080.050
Seal (4 x) 14x17x1.5 DIN 7603-Cu:	0.107.603.033

If removal and installation of the fuel-injection pump is carried out by Bosch Service, then this modification can be implemented in its entirety.

If the removed fuel-injection pump is delivered, the on-the-engine modification is to be carried out by the Kässbohrer Service Workshop.
In such cases, the fuel-injection-pump conversion must be coordinated with the Kässbohrer Workshop, since a fuel-injection pump with inclined-running capability cannot be operated without an oil return line.

These measurements are to be performed at cost.

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)

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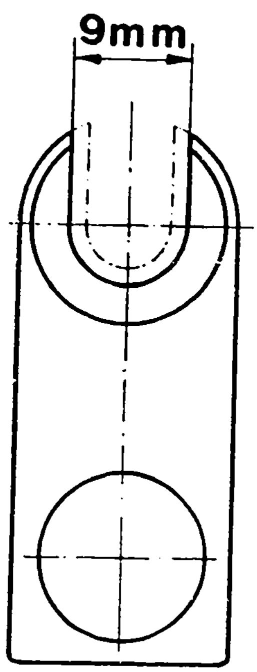
SEALING TOOL
KDEP 1619
Modification to recess

Workshop: EP
11.1989
0201 En

For technical reasons and so as to make for more universal applicability, the jaw recess on the sealing tool KDEP 1619 has been altered.
Sealing tools already supplied are to be modified in line with the following diagram, so that they too can be employed as envisaged.



420/576

Published by:

Robert Bosch GmbH
Division KH
After-Sales-Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country

ENGINE
VIBRATION
on comm. veh. with
PE(S)..P.. pumps

Motor vehicle: FZD
and workshop: EP
12.1989
0203 En

Vibration when idling may be encountered on engines equipped with an injection-pump assembly featuring a PE(S)..P.. pump. The cause of the above may be a sticking delivery-valve assembly. Fuel-injection pumps from engines exhibiting this fault are to be removed from the engine and checked on an injection-pump test bench.

This fault can be detected with the procedure described in the following:
After testing the injection-pump assembly, loosen and unscrew all test-pressure lines at the delivery-valve holders of the fuel-injection pump.
Run injection-pump assembly at approx. 100 min^{-1}. Move control rod to stop position with control lever or stop lever. Calibrating oil must not emerge at delivery-valve holders. If calibrating oil does emerge, the delivery-valve assembly fitted is to be replaced with a new one. The test described above is then to be repeated.

Following elimination of fault, detach injection-pump assembly from test bench and install it again on engine.

Published by:

Robert Bosch GmbH
Division KH
After-Sales-Service Department for
Training and Technology (KH/VSK)

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ELECTRONICALLY CONTROLLED DIESEL FUEL INJECTION (EDC SYSTEM) WITH SIZE P IN-LINE FUEL-INJECTION PUMP

The second half of 1989 will see the market launch throughout Europe of heavy commercial vehicles from various manufacturers with electronically controlled diesel fuel injection (EDC system).

System design
(Abbreviated designation): M 7

Solenoid governor actuator:
RE 24/RE 30

The following description refers to the basic EDC system.

Vehicle-specific special features relating to the functional scope and to the limp-home/diagnosis system are not considered.

BASIC SYSTEM

As with conventional, mechanically controlled diesel systems, the injection-pump assembly of the EDC system is made up of the actual fuel-injection pump and an actuator flanged to it.

The conventional method is likewise used for supplying the fuel low-pressure system by means of a mechanical supply pump driven by the camshaft of the fuel-injection pump.

The injection section consists of the familiar, proven size P high-pressure fuel-injection pump.

For controlling the quantity of fuel injected, use is however not made of a mechanical governor, but rather of a solenoid actuator flanged directly to the fuel-injection pump.

The most important component of the actuator is a linear magnet, the armature of which acts directly on the control rod of the fuel-injection pump and thus determines the quantity of fuel injected by way of the control-rod travel.

The linear magnet in the actuator is activated by way of an electronic control unit employing microprocessor techniques. Its program memory contains the maps established for all engine operating conditions.

Comparing the EDC system to mechanical control reveals the following basic distinguishing features: With a mechanical governor, all the assemblies affecting the governor characteristics (flyweight assembly, springs, torque-control spring retainer, stops etc.) are contained in the governor itself.

These components have to be replaced by components of a different design if the governor characteristics are to be altered.

With the EDC system the actuator is always the same irrespective of the map.

Maps, corrections etc. are determined exclusively by the electronic control unit and are part of the software.

In addition to the adjusting magnet already mentioned the actuator contains the following components:
An inductive engine-speed sensor (system speed sensor), a rack position sensor (half differential inductive pickup) and an oil supply pump for conveying oil from the actuator back into the camshaft chamber of the fuel-injection pump.

With the EDC system there is no mechanical linkage between accelerator pedal and governor. The pedal is linked by way of a pushrod to a pedal-operated sensor which contains a rotary potentiometer.

The potentiometer signal is passed as driver intention to the electronic control unit.

The force exerted by the armature in the actuator causes the control rod to move in the "FULL" direction; the counter-force is provided by a spring at the control rod which causes the control rod to be moved in the "STOP" direction when no current is being applied.

To determine the right quantity of fuel injected for each operating status, the electronic control unit processes information regarding driver intentions from peripheral sensor systems (ignition key, position of accelerator pedal, various function switches) as well as information on external parameters such as engine temperature, air temperature, fuel temperature, charge-air pressure, position of control rod, engine speed and vehicle speed.

A rack position sensor in the actuator constantly determines the instantaneous travel of the control rod and passes the values to the control unit.

The entered values are compared to the set values calculated from the stored data and correction is effected automatically in the event of a deviation.

In addition to the basic function of controlling the injected fuel quantity as described above, the EDC system is also responsible for the following functions:

HANDLING MAP, GOVERNOR CHARACTERISTICS:

For driving, the system operates either as a minimum/maximum speed governor (RQ characteristic) or as a variable speed governor (RQV characteristic).

In the case of PTO, the system takes the form of an intermediate speed controller (variable speed governor, offset = 0).

The intermediate speed for PTO is set by means of the operating unit of a cruise control system likewise integrated into the EDC system.

Engine speed setting with the vehicle stationary is analogous to vehicle speed setting.

IDLE-SPEED CONTROL:

The system features idle-speed control so that - in the event of load changes (converter, concrete mixer or cold engine) - the idle speed remains stable.

This also means that the idle speed can be kept at a low level.
Moreover, the vehicle can be driven off without actuating the accelerator pedal thanks to the idle-speed control.

The regulated idle speed can be subsequently altered in fixed increments of 10 min-1 in the range between two specific limit speeds. The limit speeds are established on a project-related basis. Adjustment is effected by way of the operating unit of the cruise control.

Adjustment conditions:

* Vehicle speed sensor O.K.
* Operating unit for cruise control O.K.
* Brake switch O.K.
* Vehicle stationary, engine at operating temperature.

Adjustment of idle speed:

1. Depress brake during the entire process.
   Press WA button for at least 3 s.
   This enables the alteration mode.
2. The idle speed is increased by one increment (10 min-1) every time the button "ON+" is pressed.
3. The idle speed is reduced by one decrement (10 min-1) every time the button "ON-" is pressed.
4. Press WA button for at least 3 s.
   This causes the set idle speed to be stored.

TORQUE LIMITATION, SMOKE LIMITATION:

Corrections are made as a function of air temperature, coolant temperature, engine speed and charge-air pressure so as to stop the engine being overloaded and in order to avoid impermissible smoke generation.

STARTING PROCEDURE:

Starting fuel delivery is output if either a lower start recognition speed (below cranking speed) is exceeded or if "full throttle" is given.

Starting fuel delivery, starting rejection speed and cold idle speed are limited as a function of the coolant temperature, in order to prevent impermissible smoke generation and unnecessary revving up of the engine after starting. The high cold idle speed is continuously regulated during the warm-up phase.

CRUISE CONTROL, CRUISE LIMITATION, INTERMEDIATE SPEED CONTROL:
The cruise control system is part of the EDC control unit. The corresponding operating unit is located in the vicinity of the driver and has the following functions:

With moving vehicle:

Cruise control.

With stationary vehicle:

Intermediate speed control.

With stationary vehicle:

Adjustment of idle speed as already described

These functions are only enabled if the service brake has been actuated at least once after starting the engine in each case.
The operating unit has up to max. 4 switch positions with the following assignments for cruise control and intermediate speed control:

Switch: ON +

Cruise control:

Increase in vehicle speed

Intermediate speed control:

Increase in engine speed

Switch: ON −

Cruise control:

Reduction in vehicle speed

Intermediate speed control:

Reduction in engine speed

Switch: WA

Cruise control:

Renewed selection of last stored vehicle speed.

Intermediate speed control:
    Selection of fixed engine speed

Switch: OFF
Cruise control:
    Control disconnection
Intermediate speed control:
    Control disconnection.

The control is disconnected on actuating the service brake, engine brake or clutch.

Disconnection likewise takes place if the selected speed is exceeded or undershot by more than 50% as a result of loading.

The originally selected vehicle speed does however remain stored and can be called up again by means of the WA button.

If a certain minimum speed is undershot, the cruise control has no function. Below this threshold the operating unit is used to set intermediate speeds.

The maximum speed limitation is permanently programmed and cannot be altered.

SIGNAL OUTPUTS:

The EDC control unit features various signal outputs which can be utilized by the vehicle or superstructure manufacturer for further displays or functions independent of the EDC. The corresponding receivers must be geared to the signals of the signal outputs.

SELF-DIAGNOSIS AND SAFETY SYSTEM:
GENERAL:
The EDC system is self-monitoring. The computer functions, the actuator and the sensors are monitored in this process.

The task of the overall safety system is to prevent injury to the driver and damage to vehicle/engine. It is also designed to facilitate fault determination. The following measures are initiated automatically depending on how a given fault is ranked:

* Switching to suitable substitute functions for further - however restricted - driving with a view to reaching the nearest workshop. If, for example, the control unit recognizes that the system engine-speed sensor (in the actuator) has failed, then switching is effected to a secondary speed sensor as redundant engine-speed signal.

This signal is tapped from terminal W of the alternator.

* Immediate switch-off of the engine if safety considerations thus require. Depending on the fault concerned, switch-off is effected by regulating the quantity of fuel to zero or by way of emergency shutoff.
Emergency shutoff is carried out by an electric shutoff device such as is employed with some mechanically controlled systems.
The electric shutoff device (ELAB) rapidly decreases the fuel gallery pressure and thus interrupts the charge.

* Display of certain faults during operation by means of a diagnosis lamp, so as to warn the driver.

* Faults detected - including temporary faults - are stored by the self-diagnosis system with a view to facilitating subsequent fault determination.

SELF-DIAGNOSIS BY MEANS OF FLASHING CODE:

By way of a flashing code, an integrated self-diagnosis system makes it possible to locate a faulty functional path.

The diagnosis lamp and the prompt button for flashing-code output are located in the vicinity of the driver.

In the event of a fault, the diagnosis lamp either flashes continuously, lights up continuously or remains off depending on the severity of the fault.

If there are several faults present, "flashing" has priority over "continuously lit" and "continuously lit" has priority over "off".

These fault indications by means of flashing or continuous light are provided for current faults and temporary (sporadic) faults.

Both current and sporadic faults are stored and can be called up by means of the flashing code even after the engine has been switched off.

For fault determination, the stored faults are indicated by means of a flashing code after pressing the diagnosis prompt button. Each detected fault is assigned a number between 1 and 15.

Example:

Fault 1 = Diagnosis lamp lights up (flashes) 1 X

Fault 8 = Diagnosis lamp lights up (flashes) 8 X

Only one fault is output per prompt.

In order to detect all faults, the prompt must be repeated until the flashing code output first appears again. The prompt button is ignored during flashing-code output.

Following fault elimination, the fault memory is to be cleared as follows:
With the ignition switched on, press diagnosis prompt button and at the same time actuate brake or clutch.

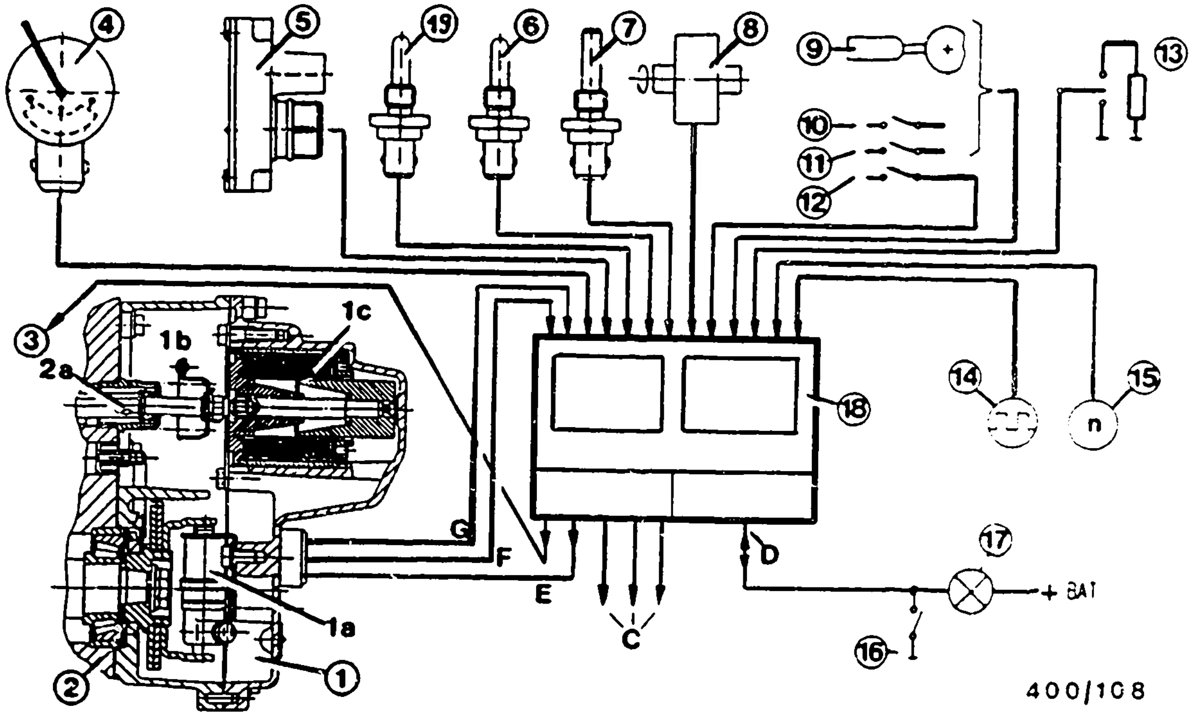
N o t e :

The self-diagnosis only recognizes missing functions or defective functional paths.

It does not however provide information as to whether the cause of the trouble is a fault in the wiring or the component itself. It also does not indicate whether the signal is outside certain limit ranges. In other words, the actual cause of the trouble within the functional path is to be determined.

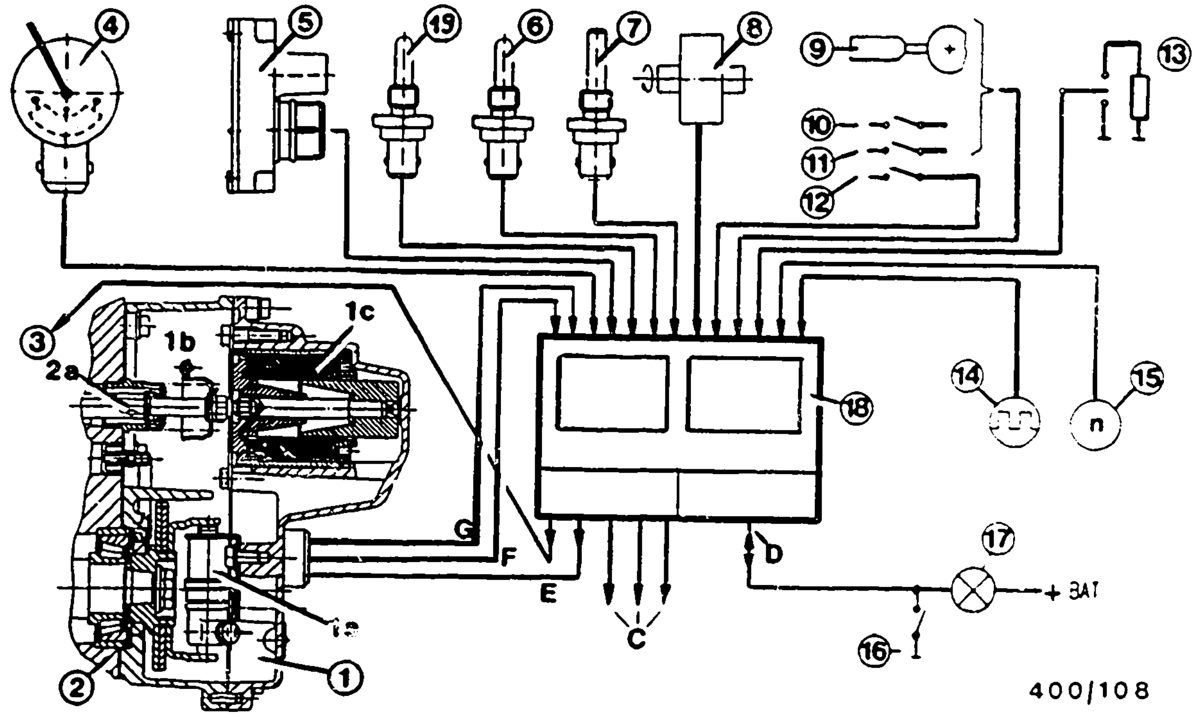
EDC SYSTEM M7
WITH SOLENOID ACTUATOR RE 24

1 = Actuator
1a = Engine-speed sensor
1b = Rack position sensor
1c = Adjusting magnet
2 = Fuel-injection pump
2a = Control rod
3 = Electric shutoff device (fuel gallery)
4 = Throttle position sensor
5 = Boost pressure sensor
6 = Coolant temperature sensor



EDC SYSTEM M 7 WITH
SOLENOID ACTUATOR RE 24 (CONTINUED)

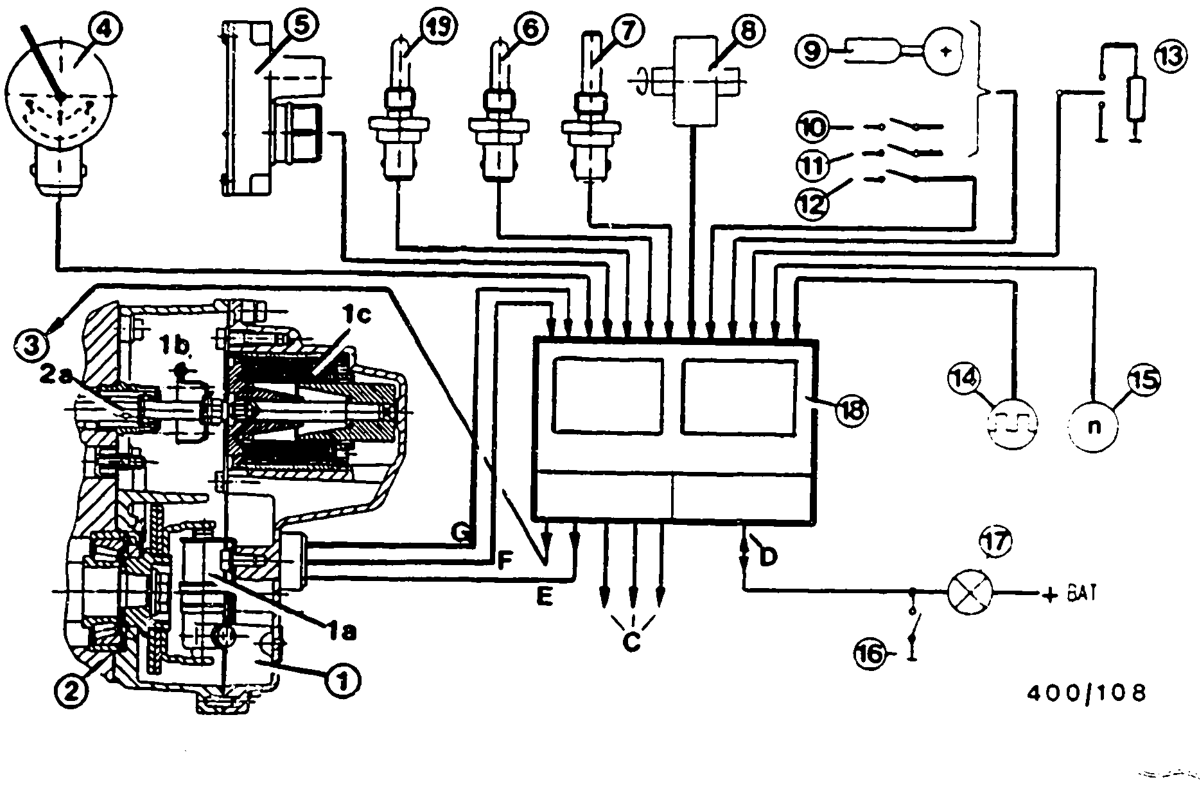
7 = Air temperature sensor
8 = Vehicle speed sensor
9 = Cruise-control operating unit
10 = Service-brake switch
11 = Clutch switch
12 = Engine-brake switch
13 = Torque encoding switch (option)
14 = External quantity intervention (option)
15 = Secondary engine-speed sensor (alternator term. W)
16 = Self-diagnosis prompt button



EDC SYSTEM M 7 WITH
SOLENOID ACTUATOR RE 24 (CONTINUED)

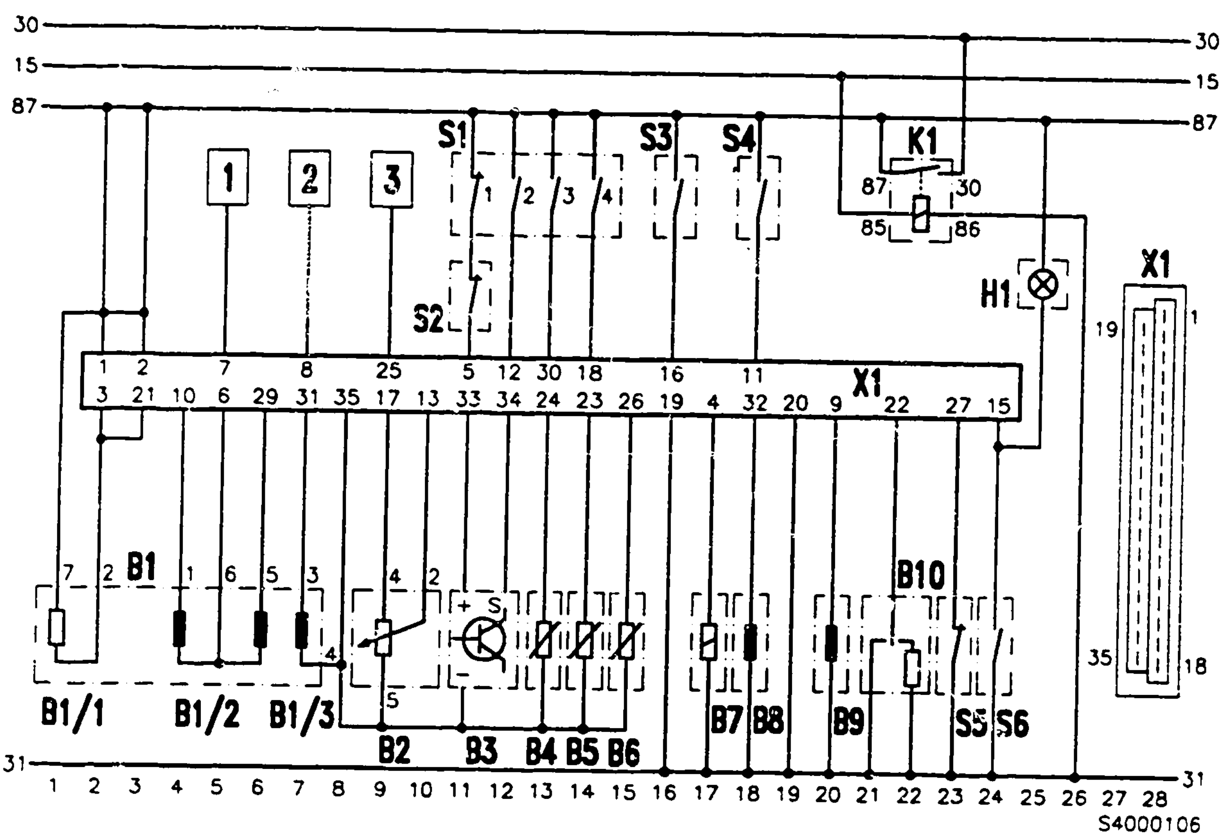
17 = Diagnosis lamp
18 = Control unit
19 = Fuel temperature sensor

B = Computer
C = Signal outputs (option)
D = Diagnosis connection
E = Adjusting-magnet actuator
F = Engine-speed signal
G = Control-rod-travel signal



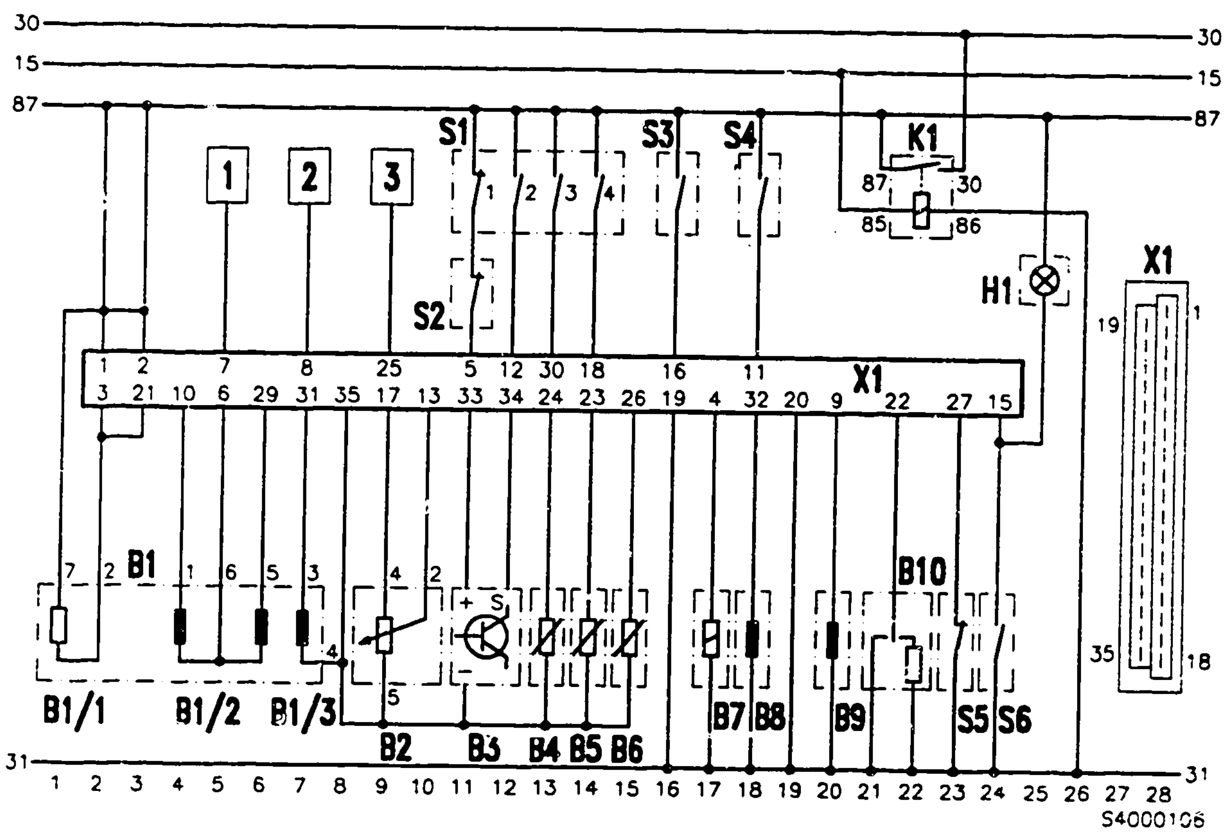
EDC SYSTEM M7,
ELECTRICAL TERMINAL DIAGRAM

B1 = Governor actuator
B1/1= Adjusting magnet
B1/2= Rack position sensor
B1/3= System engine-speed sensor
B2 = Throttle position sensor
B3 = Boost pressure sensor
B4 = Fuel temperature sensor
B5 = Coolant temperature sensor
B6 = Air temperature sensor
B7 = Electric shutoff (ELAB)
B8 = Secondary engine-speed sensor
(alternator term. W)



EDC SYSTEM M7, ELECTRICAL
TERMINAL DIAGRAM (CONTINUED)

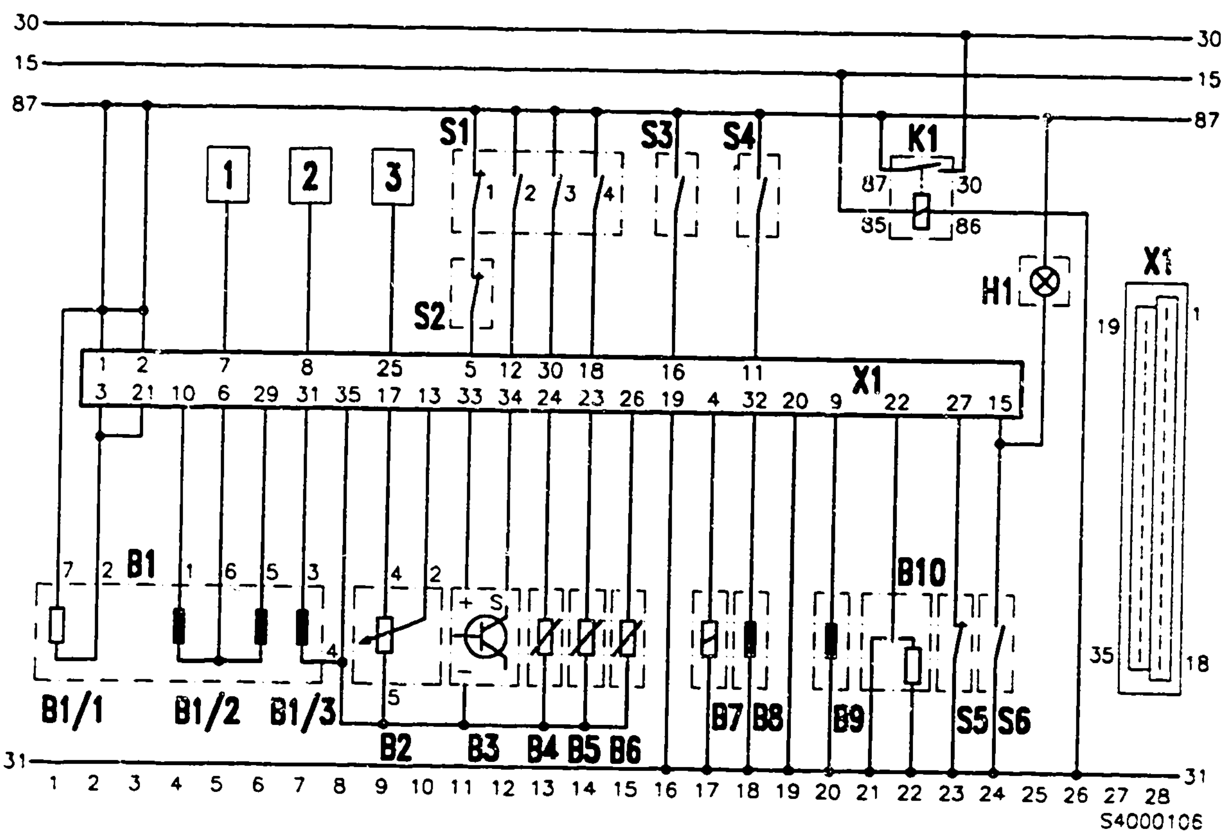
B9 = Vehicle speed sensor
B10 = Torque encoding switch (option)
H1 = Diagnosis lamp
K1 = Main relay
S1 = Cruise-control operating unit
S1/1 = Switch "OFF"
S1/2 = Switch "ON -"
S1/3 = Switch "WA"
S1/4 = Switch "ON +"
S2 = Brake switch (2)
S3 = Engine-brake switch



EDC SYSTEM M7, ELECTRICAL
TERMINAL DIAGRAM (CONTINUED)

S4 = Brake switch (1)
S5 = Clutch switch
S6 = Self-diagnosis prompt button
X1 = Control-unit connector

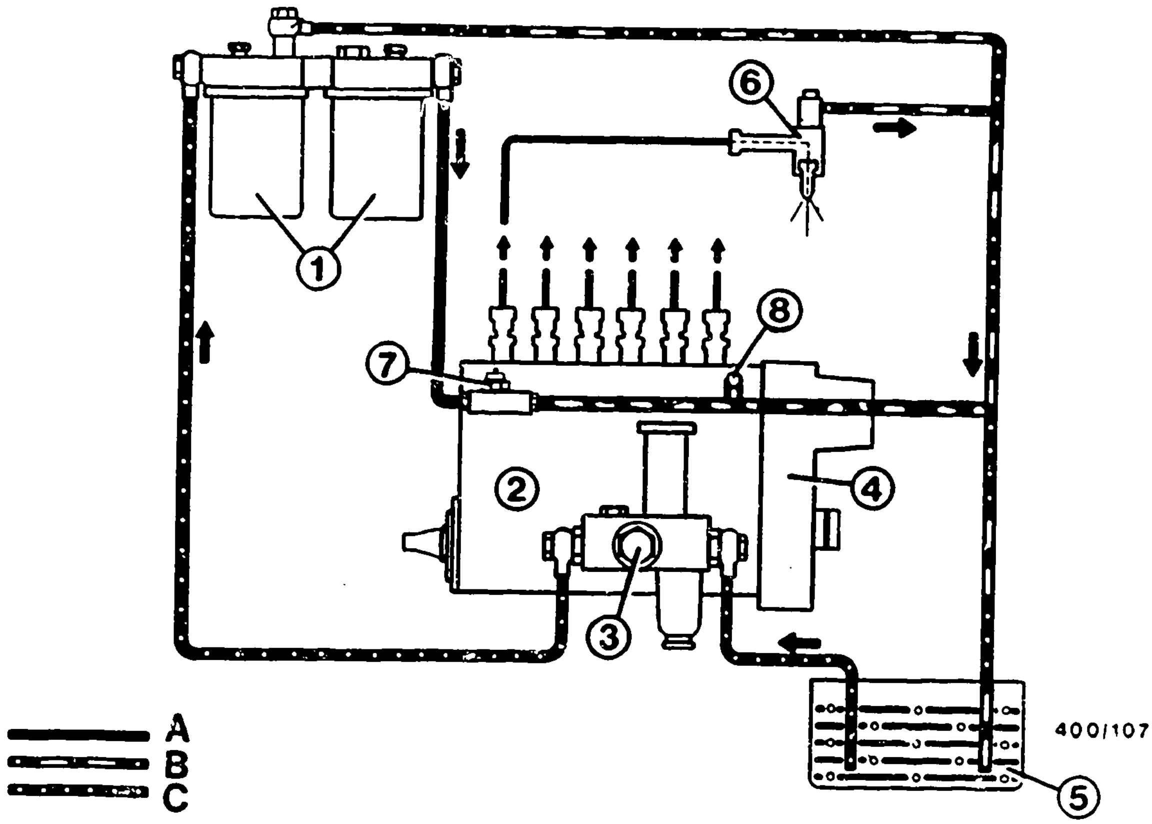
1 =)
2 =) Signal outputs (option)
3 =)



EDC SYSTEM M7 WITH ACTUATOR RE 24, RE 30, HYDRAULIC CONNECTION DIAGRAM

1 = Fuel filter
2 = Fuel-injection pump
3 = Supply pump
4 = Actuator
5 = Fuel tank
6 = Injection nozzle(s)
7 = Electric shutoff device (ELAB)
8 = Overflow valve

A = Cleaned fuel
B = Overflow
C = Uncleaned fuel with gas and air bubbles



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DATE OF MANUFACTURE FOR BOSCH PRODUCTS AS OF 1990

Workshop:
EP, EL, NB
01.1990
0208 En

After 10 years, the monthly code figures for the date of manufacture (MD) of BOSCH products have changed.

The monthly code figures 61 - 72 will be used for the months of January to December in the years 1990 - 1999.

The monthly code figures are preceded by the code figures for the year in the 3-digit date of manufacture (see following list).

The precise dates of manufacture of the defective products are to be indicated on all warranty claims, since they are of great importance for quality check and control.

	1989	1990	1991	1992
January	941	061	161	261
February	942	062	162	262
March	943	063	163	263
April	944	064	164	264
May	945	065	165	265
June	946	066	166	266
July	947	067	167	267
August	948	068	168	268
September	949	069	169	269
October	950	070	170	270
November	951	071	171	271
December	952	072	172	272

	1993	1994	1995	1996
January	361	461	561	661
February	362	462	562	662
March	363	463	563	663
April	364	464	564	664
May	365	465	565	665
June	366	466	566	666
July	367	467	567	667
August	368	468	568	668
September	369	469	569	669
October	370	470	570	670
November	371	471	571	671
December	372	472	572	672

	1997	1998	1999
January	761	861	961
February	762	862	962
March	763	863	963
April	764	864	964
May	765	865	965
June	766	866	966
July	767	867	967
August	768	868	968
September	769	869	969
October	770	870	970
November	771	871	971
December	772	872	972

Published by:

ROBERT BOSCH GMBH
Division KH
Technical After-Sales Service
(KH/VKD 2)

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MODIFICATION TO
MEASURING TOOL FOR
TIMING-DEVICE TRAVEL
1 688 130 139
FOR DI PUMPS

Workshop: EP
02.1990
0213 En

Utilization of the existing measuring tool for timing-device travel in conjunction with heavy duty DI pumps had to be adapted to the hydraulic conditions (pressure peaks up to 60 bar).
These pressure peaks are the result of counter-torques (vibrations) acting on the timing-device piston.

In order to cope with the hydraulic requirements, the sight glass has been provided with reinforcement in the form of a metal jacket (with window).

Part no. 1 680 309 046

Measuring tools 1 688 130 139 for the timing-device travel have been available with metal jacket since 11.89.

Test instructions:

Heavy duty distributor-type fuel-injection pumps (note in test-specification sheet) may only be tested using a timing-device-travel measuring tool with metal jacket.

For safety reasons, timing-device-travel measuring tools without metal jacket are to be converted.

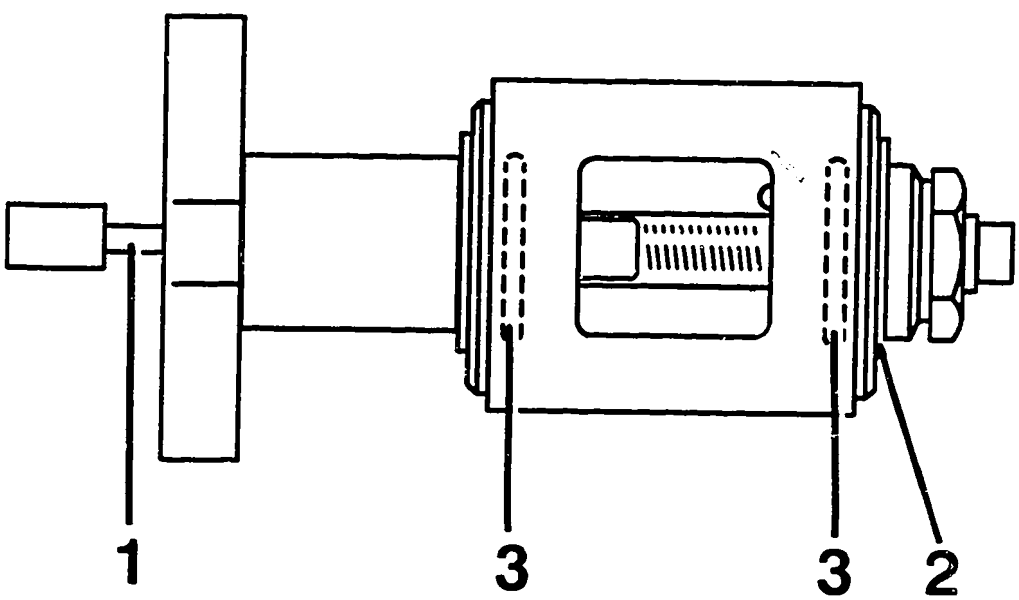
When using the reinforced timing-device-travel measuring tool, it is no longer necessary to wear protective goggles (see Service Information dated 7.87 – Danger of accident with timing-device-travel measuring tool).

1 = Measurement stand
2 = Retainer
3 = O-rings

CONVERTING TIMING-DEVICE-TRAVEL MEASURING TOOL

Take care not to damage (bend) the measurement stand when replacing the sight glass.

- Remove retainer.
- Remove old sight glass.
- Replace both O-rings with the new O-rings provided.
- Moisten O-rings and inside of new sight glass with oil.
- Attach sight glass with metal jacket.
- Fit retainer.



KMK 107

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HYDRAULIC GOVERNORS
0 427..
H 10, H 15, H 20, H 25
After-Sales Service and
procurement of service parts

Workshop: EP
02.1990
0214 En

The production of hydraulic governors for original equipment has been taken over by the PIELSTICK Company.
In addition to manufacture, PIELSTICK is responsible for distribution, after-sales service and repairs. As of now, service parts are to be obtained from the following address:

S. E. M. T. PIELSTICK
Etablissement de Saint-Nazaire
Avenue de Chatonnay
B.P. 427
F-44608 SAINT-NAZAIRE Cedex

Telephone: (16) 40.90.65.00
Telefax : (16) 40.90.68.98

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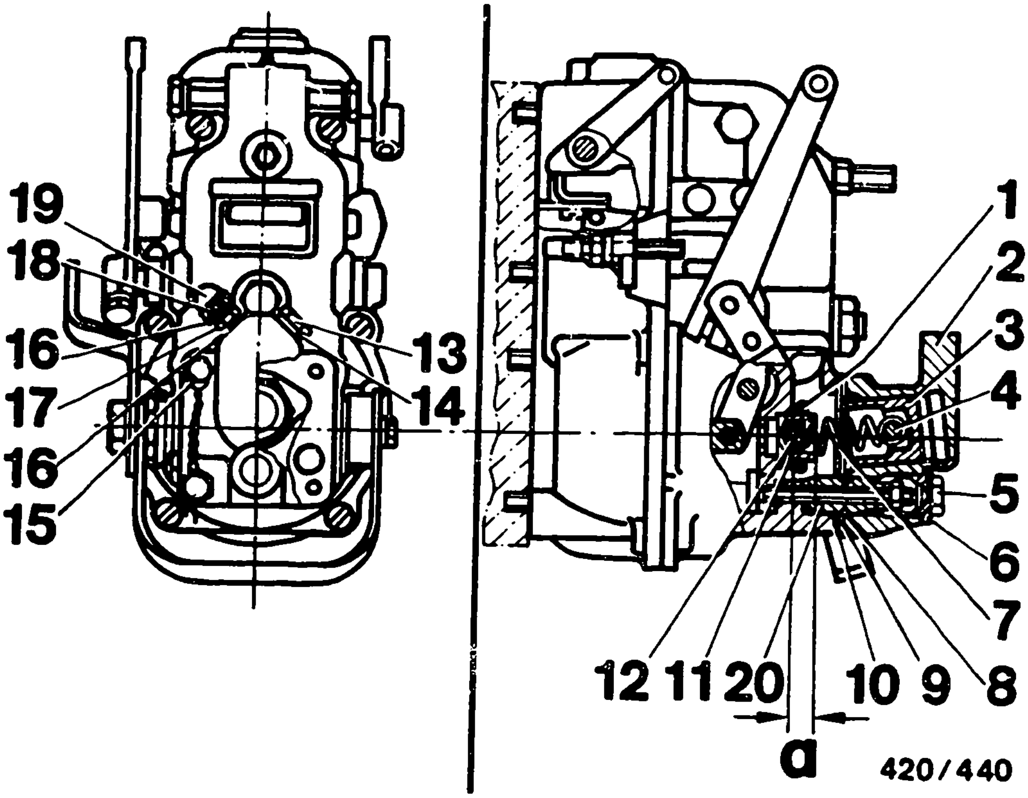
RSV GOVERNORS

Information on
assembly and
testing of stabilizer

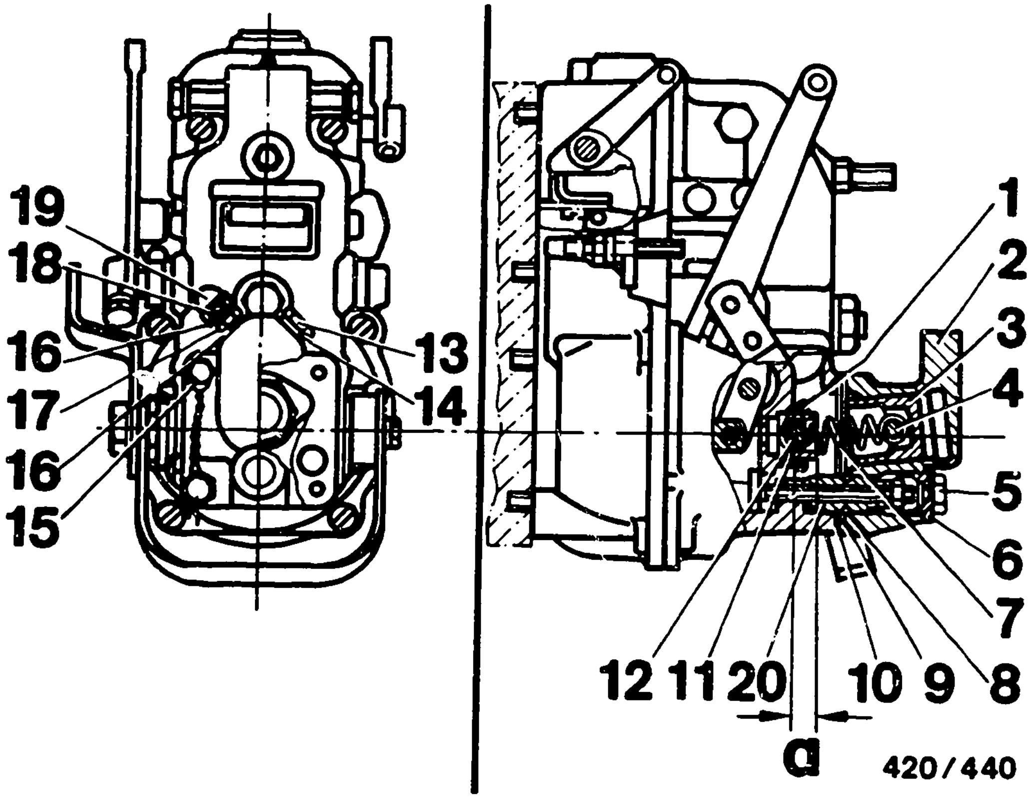
Workshop: EP
02.1990
0041 En

1 = Lock nut
2 = Stabilizer housing
3 = Stabilizer plunger
4 = Pin
5 = Screw plug
6 = Seal ring
7 = Stabilizer spring



8 = O-ring
9 = Gasket
10 = Separator sheet
11 = Threaded bushing
12 = Pin
13 = Screw plug
14 = Seal ring
15 = Fastening screw
16 = Seal ring
17 = Lock nut
18 = Throttle screw
19 = Cap nut
20 = Guide bushing

a = Projection



ASSEMBLY

Prerequisite:
Complete injection-pump assembly without attached stabilizer is clamped in position on injection-pump test bench and sliding-sleeve position of governor has been set (see RSV-governor test instructions, section "Setting sliding-sleeve position")

In the case of A-pumps the injection-pump assembly is driven by means of test-bench multi-plate clutch and jaw-type coupling half. P-pump assemblies are driven using the intermediate flange 1 685 700 140 and the driving coupling 1 686 401 024.

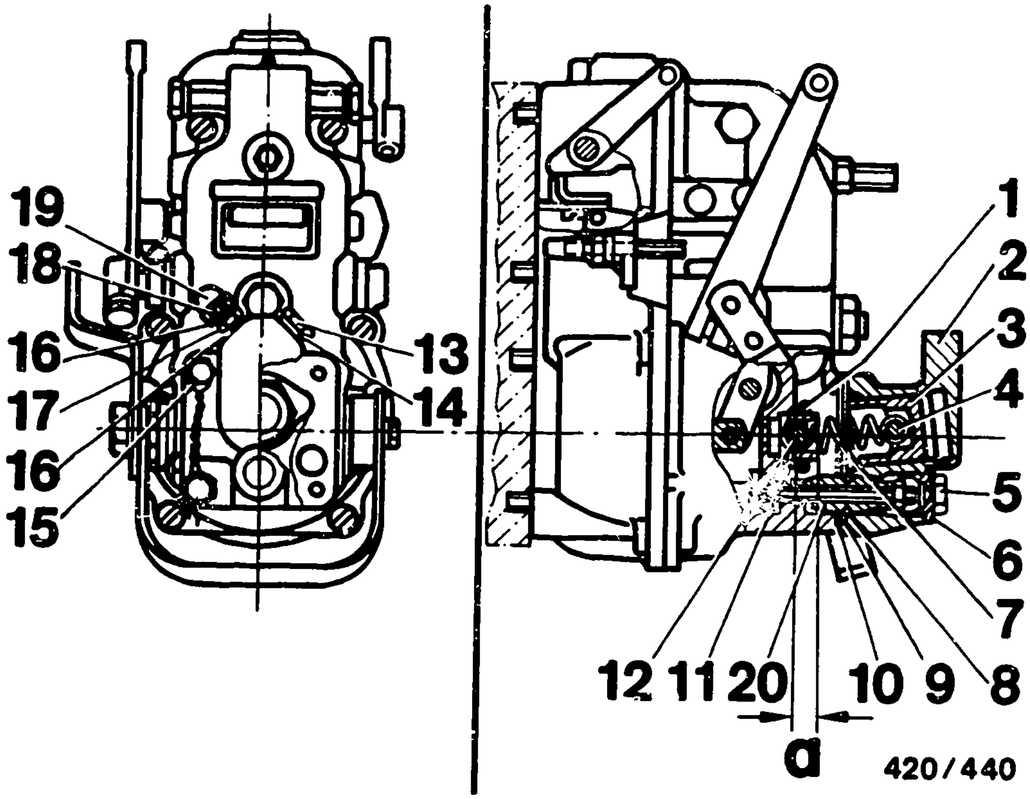
Use is always to be made for safety reasons of the appropriate hand guard 1 685 510 022.
This likewise ensures that any lubricating oil emerging at the bearing end plate is caught.

In line with the diameter of the camshaft, use is to be made of the appropriate protective cap from the KDEP 1706 range to seal A-pumps at the bearing end plate and thus to prevent the escape of lubricating oil.

Assemble threaded bushing (item 11), pin (item 12), spring (item 7) and lock nut (item 1) and then screw the above assembly into the threaded hole in the governor tensioning lever where the torque-control spring retainer is normally located.

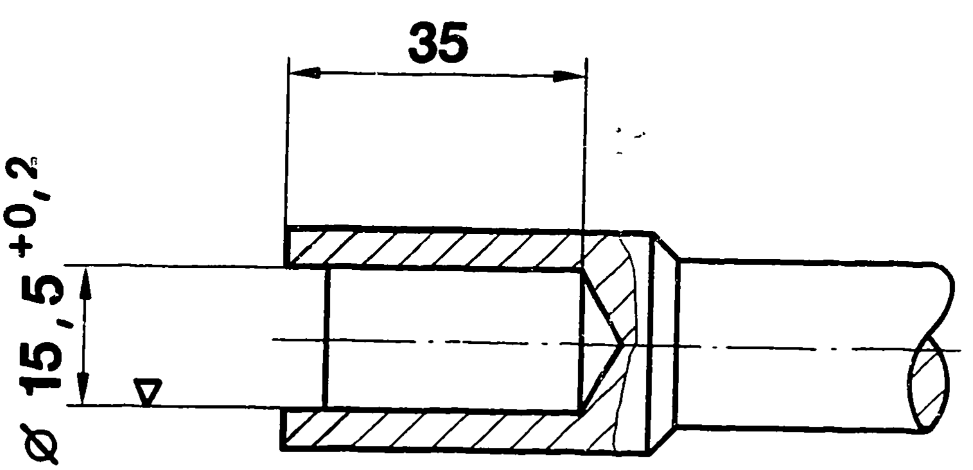
Care is to be taken to ensure that the eyelets of the stabilizer spring are precisely aligned with the longitudinal axis of the tensioning lever.

The projection dimension "a" of the screwed-in threaded bushing is 7.0...8.0 mm.



For screwing in and tightening the entire assembly, use is to be made of the modified socket wrench KDEP 2966 (see picture) and the lock nut is to be tightened to 30...35 Nm.

After checking the freedom of movement of the spring mount, moisten stabilizer plunger (item 3) with lubricating oil and position with pin (item 4) in spring eyelet (spring eyelet must engage in pin groove).
Check freedom of movement and straight positioning of stabilizer plunger.



420/441

Position separator sheet (item 10) and gasket (item 9) on sealing surface of governor cover.

Moisten O-ring (item 8) with mixture of oil and talc 5 963 340 110 and position on guide bushing (item 20).

Assemble stabilizer housing (item 2) and screw on to governor housing with fastening screws (item 15).

Prescribed tightening torque: 6...8 Nm.

Testing:

Open throttle screw (item 18) by approx. 4...5 turns after removing cap nut (item 19). Remove screw plug (item 13). Screw tailpiece of test hose (KDEP 1618) into tapped hole. The hose must be laid perpendicularly.

Fill up governor with lubricating oil until oil level can be seen at transparent hose KDEP 1618.

Set control lever to maximum stop and fix in this position.

Switch on test bench and drive injection-pump assembly at speed prescribed for setting full-load delivery.

Increase speed until governor completely regulated and then reduce again to initial speed.

Repeat this procedure (increasing and reducing speed) 4 - 5 times.

On increasing speed, the oil level in the test hose KDEP 1618 must always increase and drop again accordingly on reducing speed.

If this is not the case, a check is to be made as to whether the stabilizer plunger (item 3) can move freely and as to whether the setting of the throttle screw (item 18) is correct. Adjust if necessary.

Switch off test bench after checking stabilizer function. Close throttle screw as far as it will go and unscrew again by 1 turn.

Tighten lock nut (item 17).

Fit seal ring (item 16) and screw on cap nut (item 19).

Screw test hose KDEP 1618 out of stabilizer housing and screw screw plug with seal ring (item 13 and item 14) into stabilizer housing. Then tighten screw plug.

Continue governor setting in accordance with test instructions (see Index Microcard W-400/00.. Testing RSV governors).

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FOREIGN-LANGUAGE
SERVICE DOCUMENTATION

Workshop:
EP/EL/NB
Motor vehicle:
PKW/NKW/FZD
03.1990
0217 En

Important information for those After-Sales Service Workshops which do not have any service documentation in their native language.

Efficient, worldwide After-Sales Service can only be guaranteed if the appropriate service documentation is available.

There are Bosch After-Sales-Service Workshops in some 120 countries in which 65 different languages are spoken.

Unfortunately we are not in a position to publish such documentation in all these languages, with the result that we must make reference to the following important information.

Numerous testing and repair operations on various products and systems are of relevance to safety. In particular, work on vehicle safety systems (ABS, ETC, EPC and the like) presupposes precise compliance with the system-specific special features which are continuously updated by means of new or supplemented service documentation.

In the event of non-compliance with important information in our instructions on account of language deficiencies, there is a possibility of faults and incorrect settings which may lead to defects and thus to accidents.

In such cases, After-Sales Service Workshops are liable for the resultant damage claims.

For this reason, employees are not to carry out testing and repair operations on products and vehicle systems if they cannot sufficiently familiarize themselves from a technical point of view with the existing service documentation.

An employee with appropriate language and/or system knowledge must be called in to perform the relevant work in such situations.

IF THIS IS NOT POSSIBLE, THE SYSTEM IN QUESTION OR THE UNIT CONCERNED IS NOT TO BE TESTED AND REPAIRED !

To improve this situation, we urgently recommend participation in training courses on the new systems and in corresponding language courses as soon as possible.

All employees are to be made aware of this Service Information. Proof of complete employee information is then to be provided by having them sign to say that they have been made aware of the above.

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Dual-spring nozzle-holder assembly

Ever more stringent emission regulations and increased awareness of noise nuisance in our environment have influenced the further development of nozzle-holder assemblies as well.

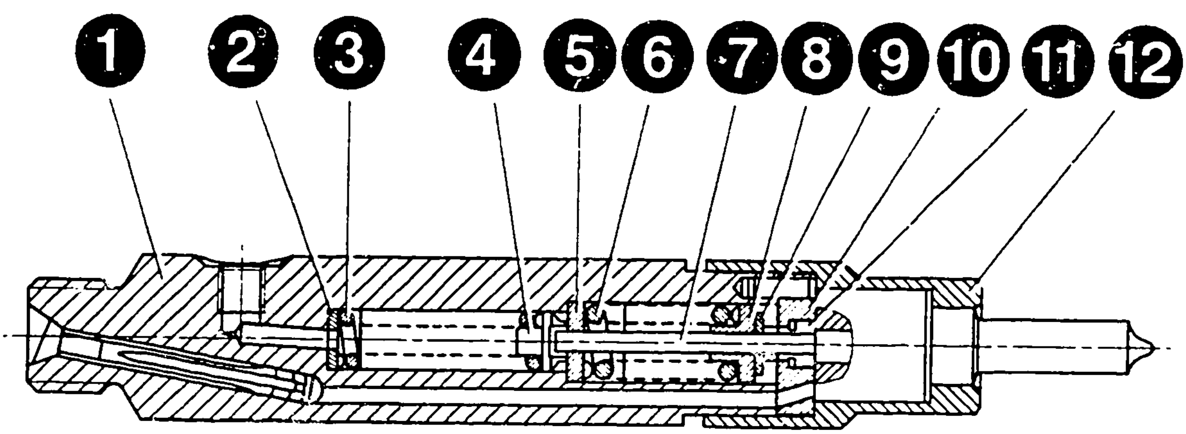
As a result, a new nozzle-holder assembly is being gradually introduced in new engines with direct injection from various manufacturers.

The nozzle-holder assembly concerned is fitted with two pressure springs, so as to be able to obtain two needle strokes of the nozzle per injection cycle given certain prerequisites.

This new system is used for nozzle-holder assemblies both with and without needle-motion sensor (NBF).

Dual-spring nozzle-holder assembly
w i t h o u t needle-motion sensor:

1 = Supporting device
2 = Shim
3 = Pressure spring
4 = Spindle
5 = Guide disc
6 = Pressure spring
7 = Pressure pin
8 = Spring seat
9 = Shim
10 = Intermediate disc
11 = Stop sleeve
12 = Nozzle-retaining nut



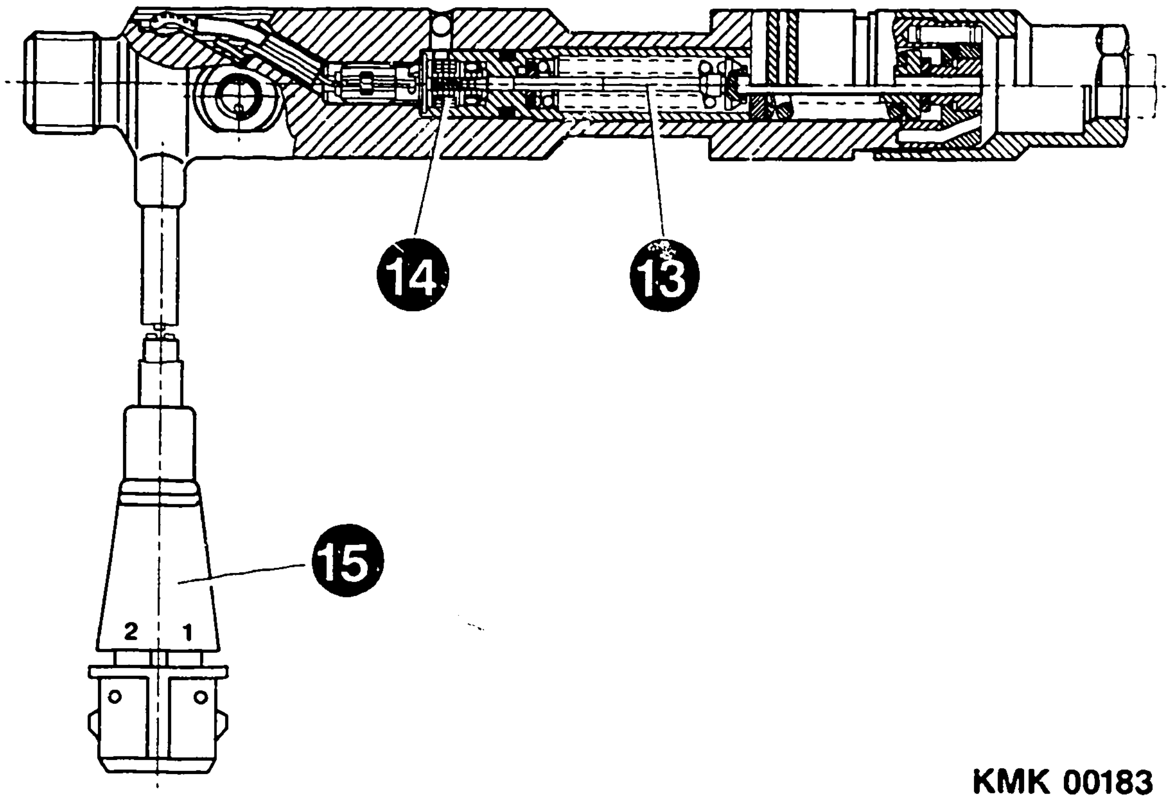
KMK00182

Dual-spring nozzle-holder assembly
w i t h needle-motion sensor:

13 = Spindle

14 = Coil

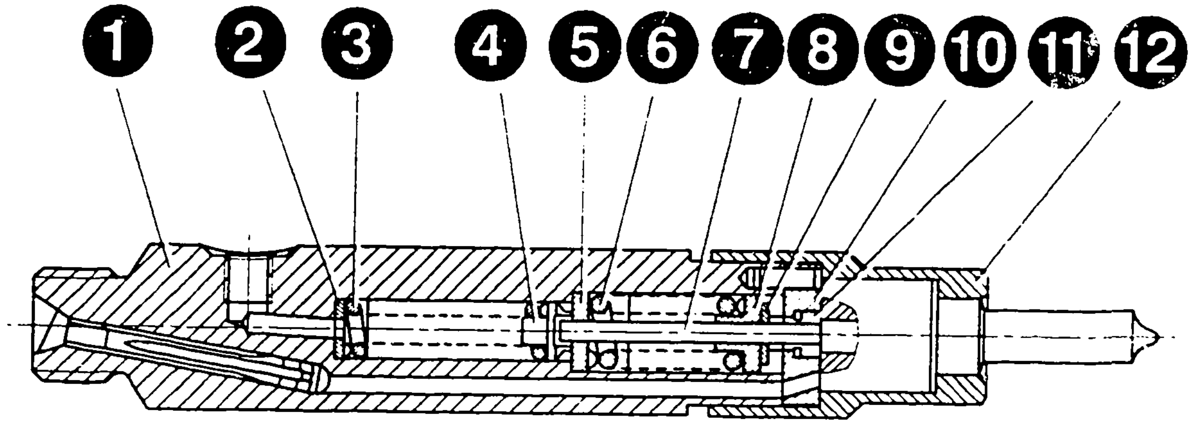
15 = Connector



KMK 00183

Mode of operation:

In the off-state, the pressure spring (3) presses the needle valve via the spindle (4) and pressure pin (7) on to its seat in the nozzle body.
As soon as the pressure in the fuel increases, the hydraulic force lifts the needle valve by way of the pressure pin (7) and spindle (4) against the pressure spring (3).
This stroke movement ends as soon as the upper end face of the needle valve makes contact with the end-face recess in the intermediate disc (10).
The stroke travelled up to this point is referred to as the prestroke (H1).

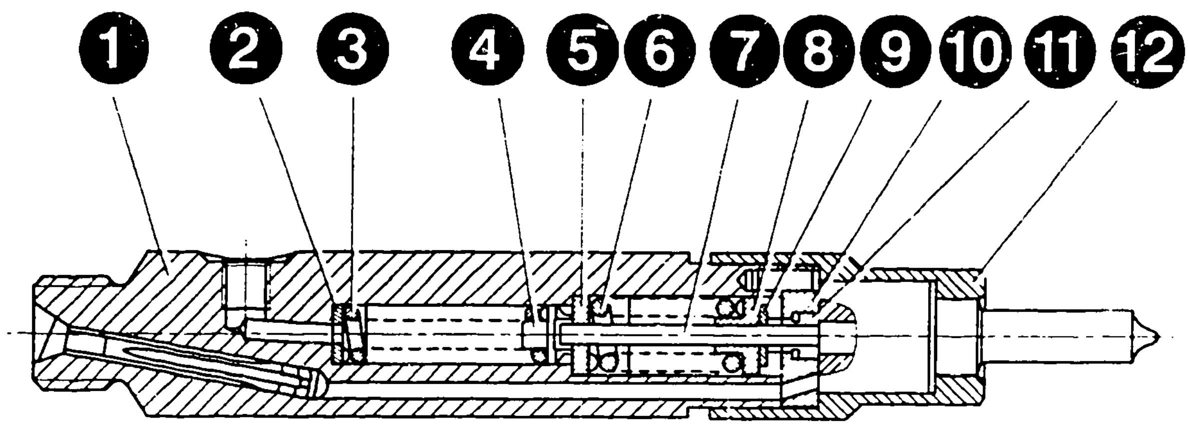


KMK00182

As soon as the prestroke H1 has been completed and the needle valve has caused the stop sleeve (11) to make contact with the intermediate disc (10), a second pressure spring (6) comes into effect.

Its force is added to the spring force of the pressure spring (3). As a result, a further increase in pressure in the fuel is required to bring about the second stroke movement of the needle valve. Once this pressure is attained, the needle valve is lifted and thus opens up an enlarged flow cross-section.

Both springs close the nozzle on completion of the injection process.

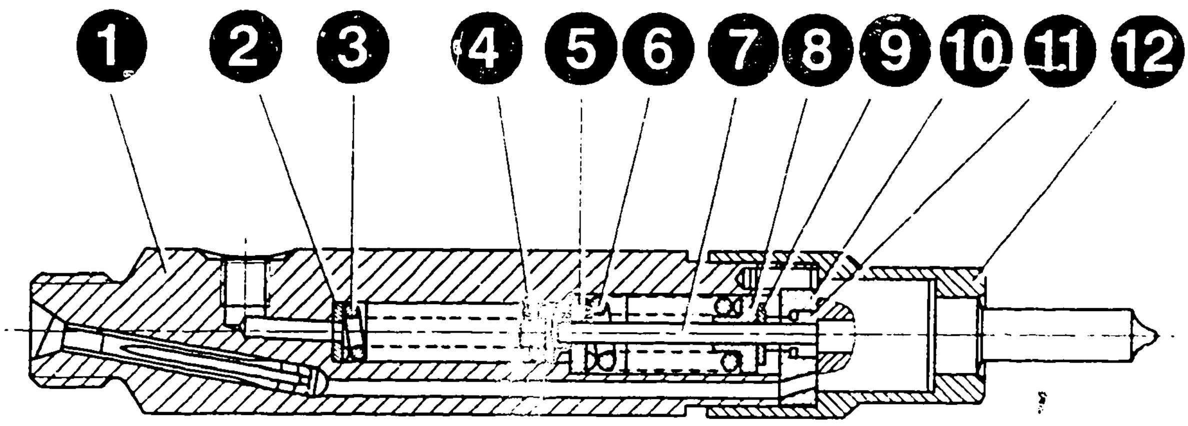


KMK00182

When idling, only the 1st stage of the nozzle is opened. This means that the engine runs relatively quietly at idling speed.

The second stage is only fully opened if the full-load delivery is conveyed at high speeds.

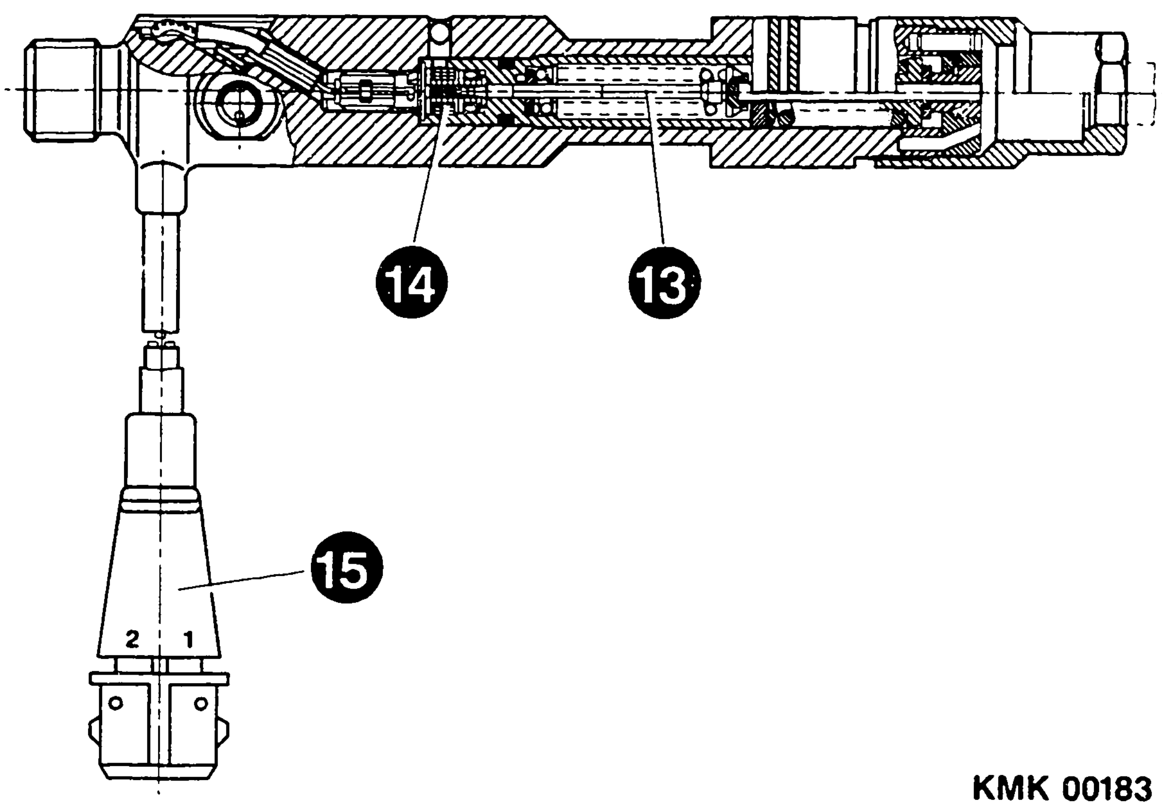
In all intermediate load and engine-speed ranges, the first stage is active, whereas the second stage is only partially active, i.e. the stop sleeve (11) does not make contact with the intermediate disc (10).



KMK00182

The version featuring a needle-motion sensor is provided in the upper section of the supporting device with an electric coil (14) in which an inductive voltage is generated as the spindle (3) moves upwards.

This voltage is supplied as a signal to a control unit via the plug (15) and a connecting cable.



KMK 00183

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Division KH
After-Sales-Service Department for
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SERVICE PROCEDURE
CUMMINS DISTRIBUTOR-
TYPE FUEL-INJECTION
PUMPS

Motor vehicle:
FZD
Workshop: EP
04.1990
0223 En

GENERAL

Cummins receive so-called basic pumps which are converted into a variant by means of a modified setting and/or a component modification.

Basic pumps are series pumps which can be recognized by way of the type designation and the 10-digit part no. Basic pumps may also be marked with a customer ident. no.
Indication is given under "Remarks" in test-specification sheet.

A variant is a pump which customers manufacture themselves by way of a modified setting and/or a component modification (e.g. different shutoff solenoid).

Bosch does not make any variants. This means that replacement variants have to be produced by modifying the corresponding basic pump.

Injection-pump variants should not be confused with experimental pump assemblies (V-numbers). Customer Service has neither service-parts lists nor test specifications for experimental pumps.

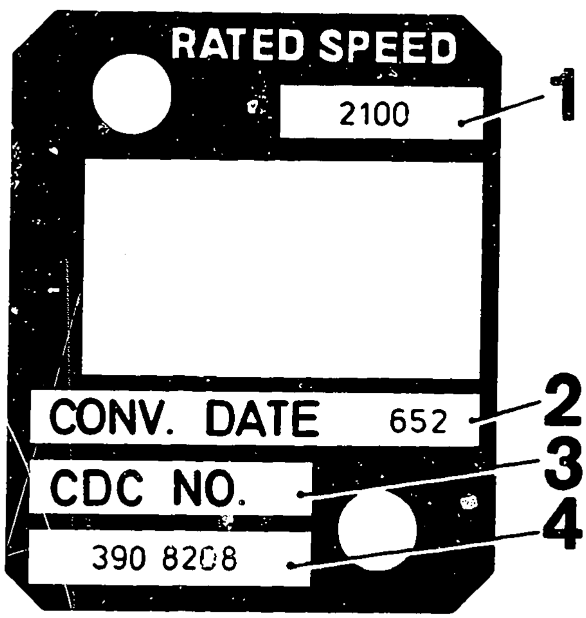
VARIANT IDENTIFICATION

Distributor-type fuel-injection pumps feature an additional nameplate on which the customer number (ident. number) and the name of the customer are indicated in addition to the date of manufacture of the variant.

A variant can be recognized from the fact that the customer ident. number is given in the test-specification sheet under the type number.

ADDITIONAL NAMEPLATE FOR VARIANTS

1 = New rated speed
2 = Date of manufacture (FD) of variant
3 = Customer trademark
4 = Customer ident. number of variant



In the event of enquiries regarding test specifications, the type designation, the 10-digit part no. and the customer ident. number are always required.

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PROTRACTOR
GOVERNOR
ADJUSTMENT

Workshop: EP
04.1990
0224 En

IA4 is offering a new protractor for the measurement of the control-lever position of fuel-injection-pump governors. The part number is 1 688 130 183. This new protractor became necessary since a standard "zero position" is now prescribed for all governors for setting the control lever.

This defined "0 degrees position" is referenced to the horizontal, i.e. in parallel with the mounting rail of the injection-pump test bench. This standard zero position was established on account of ever more frequent use being made in factories of computer-aided injection-pump test benches.

As regards service work, care is therefore to be taken to ensure that corresponding angles are given in the injection-pump test specifications.

The new angles, which are referenced to the new measuring device 1 688 130 183, can be recognized as follows in the test specifications:

Maximum control-lever deflection with RQV governors greater than 80 degrees (previously max. 70 degrees): for RS(V) governors greater than 90 degrees (previously max. 80 degrees). It should further be noted that the zero degrees position of the control lever is no longer identical with the shutoff position.

For organizational reasons, it is not possible to introduce the new angles on a uniform basis and simultaneously. When employing injection-pump test specifications, it must therefore be determined on a case to case basis whether the angles refer to the old protractor or to the new protractor.

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PES..A-2000 Motor vehicle: FZD
9 400 085 292/297/298 Workshop: EP
Ford 6.6 l 06.1990
Cracked Delivery Valves 0226 En

Some engines equipped with the above injection pumps may develop a "miss" due to cracked delivery valves (PN 9 401 083 462).
When servicing injection pumps manufactured in the month 945 and 946, inspect all 6 delivery valves for their date of manufacture.

If the delivery valves are of 945 manufacture, they must be replaced with those of another manufacturing date.

Note:
The manufacturing date can be found on the valve body. Do not confuse it with the manufacturing plant code "908" which is surrounded by an oval.

Standard warranty terms apply.

ROBERT BOSCH Corporation
Service Department
Automotive & Diesel Products
(UA/ASV)

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PES 6 P..

Workshop: EP
06.1990
0229 En

Injection-pump assemblies
on engines manufactured by MACK

Note on test specifications

For testing/adjustment on an injection-pump test bench, the genuine engine equipment is prescribed for certain injection-pump assemblies fitted to MACK engines.

The special symbol "*" is being incorporated into the "Service Ident No." column of the contents microcards WP 00 and WP 01 to identify these test specifications. The corresponding engine nozzle-and-holder assembly is also listed in every test-specification sheet.

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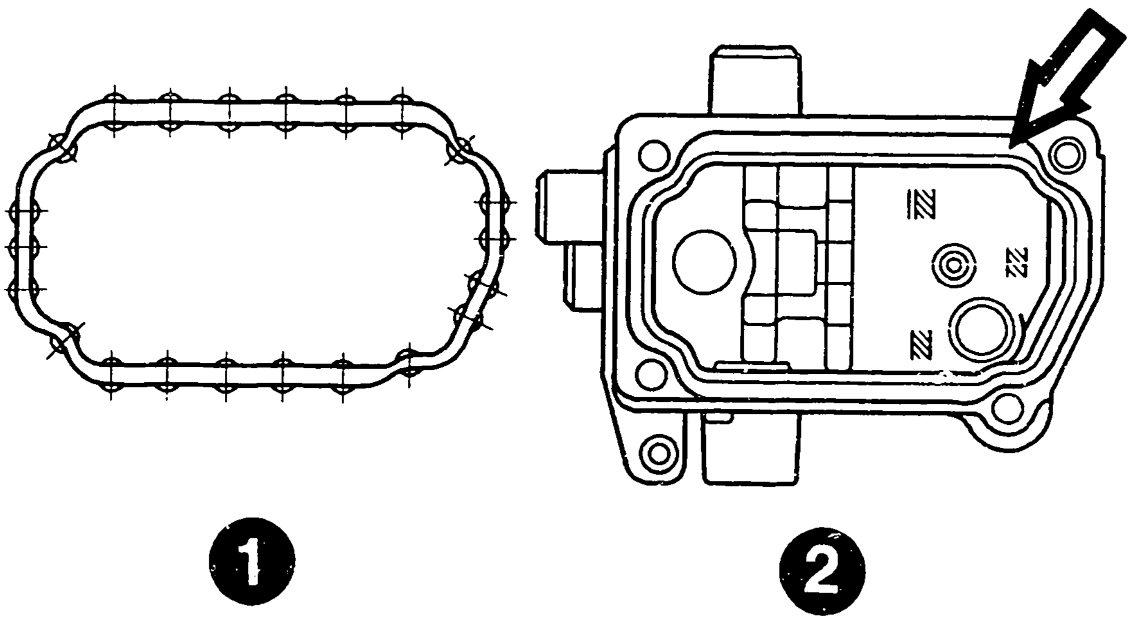
VE..F..pumps
Alteration to gasket
at housing cover

Workshop: EP
06.1990
0230 En

In order to further improve freedom from leaks at the housing cover, the gasket 1 460 206 303 used to date is being replaced by the gasket 1 461 015 300 (item 1).

1 = Gasket 1 461 015 300
2 = Modified housing cover
Arrow = broader groove area



KMK 00281

In view of the fact that the new gasket necessitates a widening of the groove in the housing cover (item 2), the gasket used to date will continue to remain a valid service part.

The housing covers and gaskets are not mutually interchangeable.

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(KH/VKD 2)

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PE(S)..P..
FUEL-INJECTION PUMPS
New pump element

Workshop: EP
07.1990
0231 En

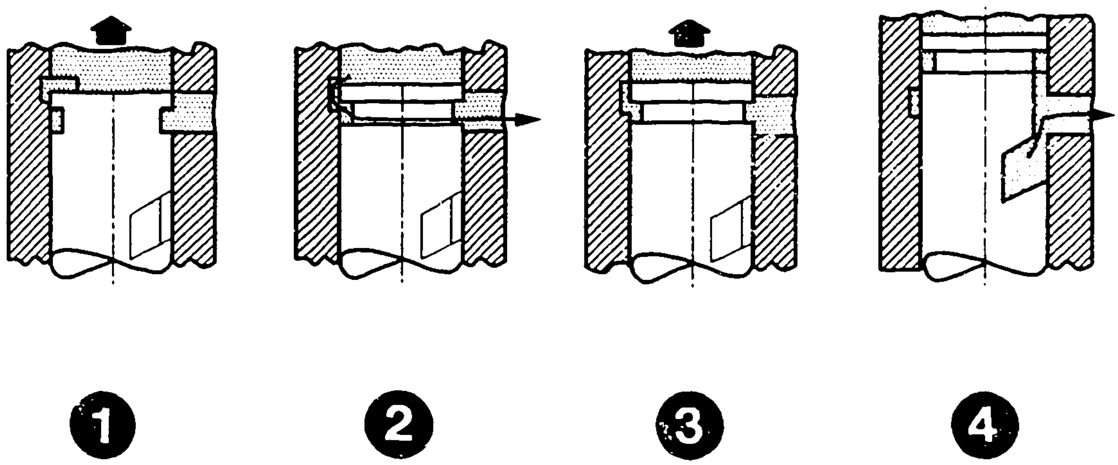
A new pump element, known as "split" element, is being introduced for fuel-injection pumps of size "P". A special feature of this new element is that it is provided with new and additional grooves and helices. This design innovation makes for a short pilot-injection phase, which, in turn, results in smoother engine running than with the use of conventional pump elements.

When checking/adjusting the prestroke of the fuel-injection pump, the pilot injection can be seen by carefully observing the overflow of calibrating oil at the overflow pipe of the calibrating nozzle-holder assembly. The end of this very small prestroke (known as prestroke 1) results in a brief interruption of the jet of calibrating oil before the actual prestroke starts. In contrast to the normal prestroke (known as prestroke 2), prestroke 1 cannot be adjusted and is therefore of no significance as regards testing/adjustment work on an injection-pump test bench. For this reason it is likewise not listed in the test specifications.

Split elements are not interchangeable with the standard plungers and barrels. In case of repairs only the pump elements listed in the corresponding service-parts list are be used.

Important plunger positions with split element:

1 = Start of prestroke 1
2 = End of prestroke 1
3 = Start of prestroke 2
4 = End of prestroke 2



KMK00291

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DISTRIBUTOR-TYPE
FUEL-INJECTION PUMPS
WITH MECHANICAL POWER
DAMPER (MLD)
0 460 494 221,.. 237 and
0 460 484 029

Workshop: EP
08.1990
0240 En

Modification of intermediate lever

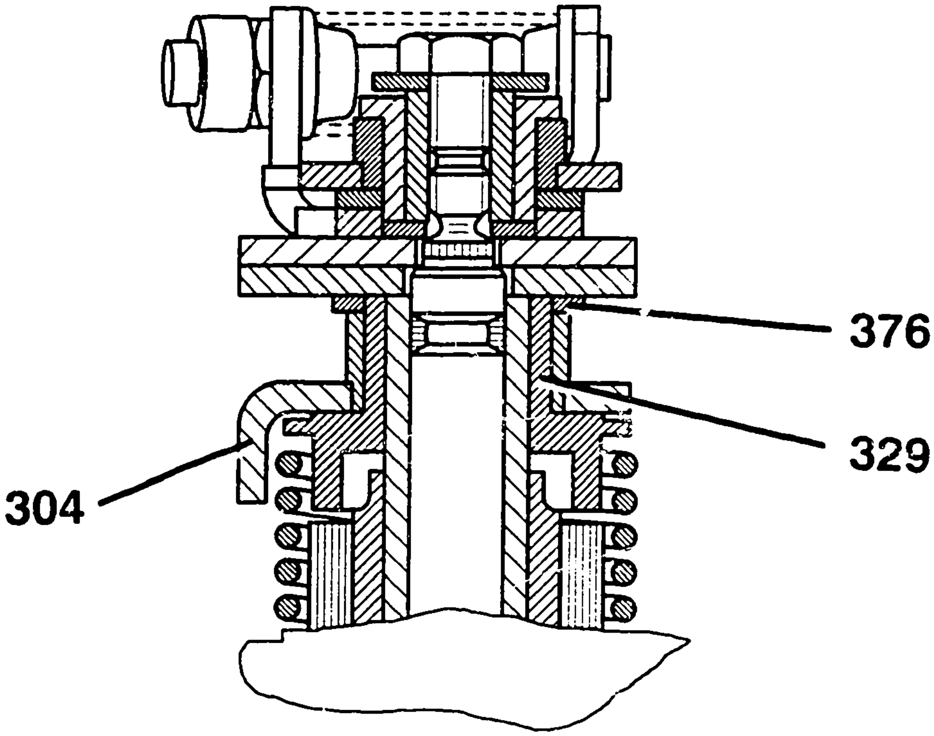
As of date of manufacture 951 (November 89) changes were made on the above-mentioned distributor-type fuel-injection pumps to the intermediate lever (Item 304), as well as to the corresponding spring seat and plain washer (Items 329 and 376 respectively) in the service-parts list.

Intermediate lever	1 461 904 523
	to 1 461 904 299
Spring seat	1 460 522 316
	to 1 460 522 314
Plain washer	1 460 101 361
	1 460 101 362
	1 460 101 363
	to 1 460 101 364

Item 304 = intermediate lever
Item 329 = spring seat
Item 376 = plain washer

When replacement is required, the component parts of the mechanical power on/off damper (intermediate lever, spring seat and plain washer) may only be exchanged together.

Individual replacement is not possible.



KMK 00299

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DISTRIBUTOR-TYPE FUEL-
INJECTION PUMP VE ..F..
WITH FOLLOWER-PISTON
TIMING DEVICE (NLK)

Workshop: EP
08.1990
0241 En

The follower-piston timing device differs from the standard timing device in that the pressure inside the pump does not act directly on the delivery end of the timing device, but rather the timing-device piston is adjusted by way of a control plunger.

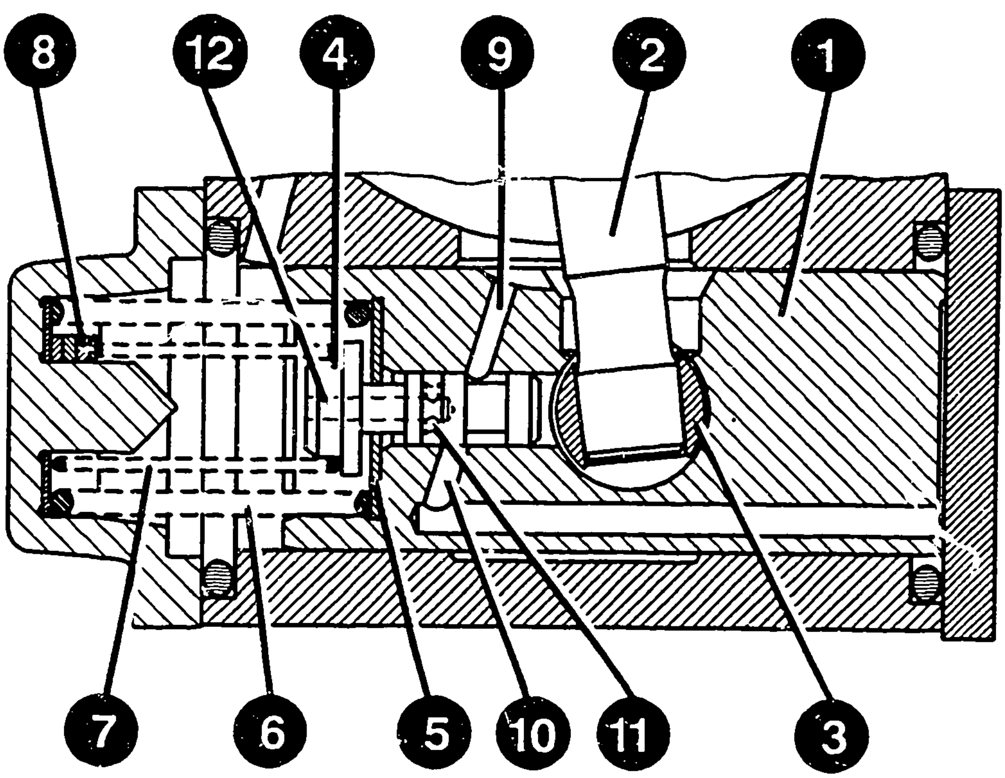
Advantages of follower piston:

* Insensitive to mechanical interference, e.g.:

* Friction at cam roller ring and effects of counter-torques are reduced by way of the follower-piston control.

COMPONENTS OF TIMING DEVICE WITH FOLLOWER PISTON

1 = Timing-device piston
2 = Sliding bolt (tappet guide)
3 = Sliding piece with ring groove
4 = Control plunger (control spool)
5 = Shim, timing-device spring
6 = Timing-device return spring
7 = Timing-device spring
8 = Shims, spring preload, control plunger
9 = Inlet port
10 = Spill port
11 = Transverse port
12 = Longitudinal port



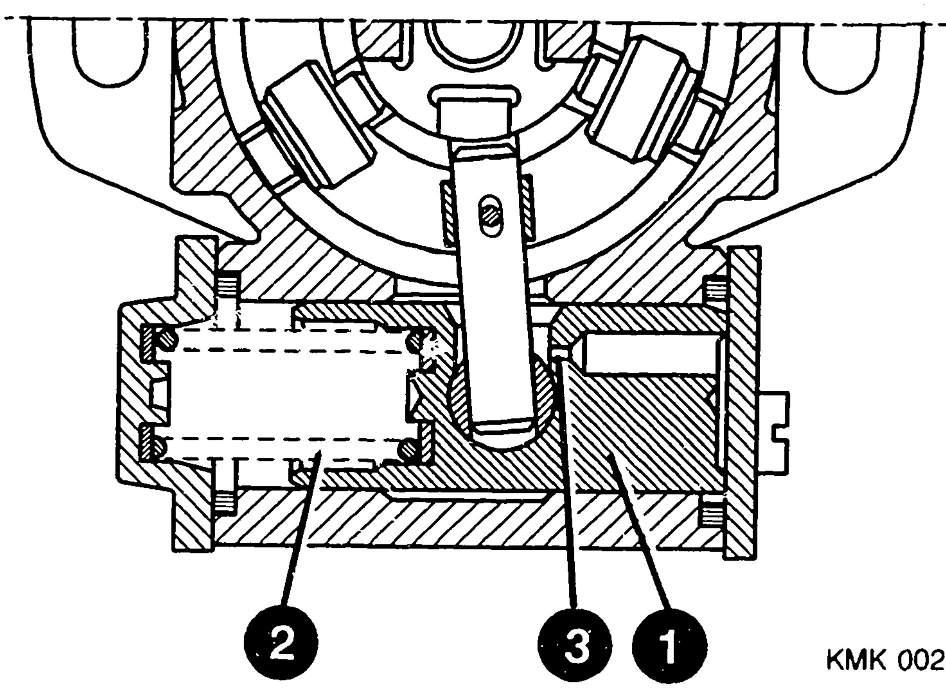
KMK 00293

COMPONENTS OF TIMING DEVICE WITH NO FOLLOWER PISTON
(Standard timing device)

1 = Timing-device piston

2 = Timing-device spring

3 = Restriction bore
Inlet to pressure side



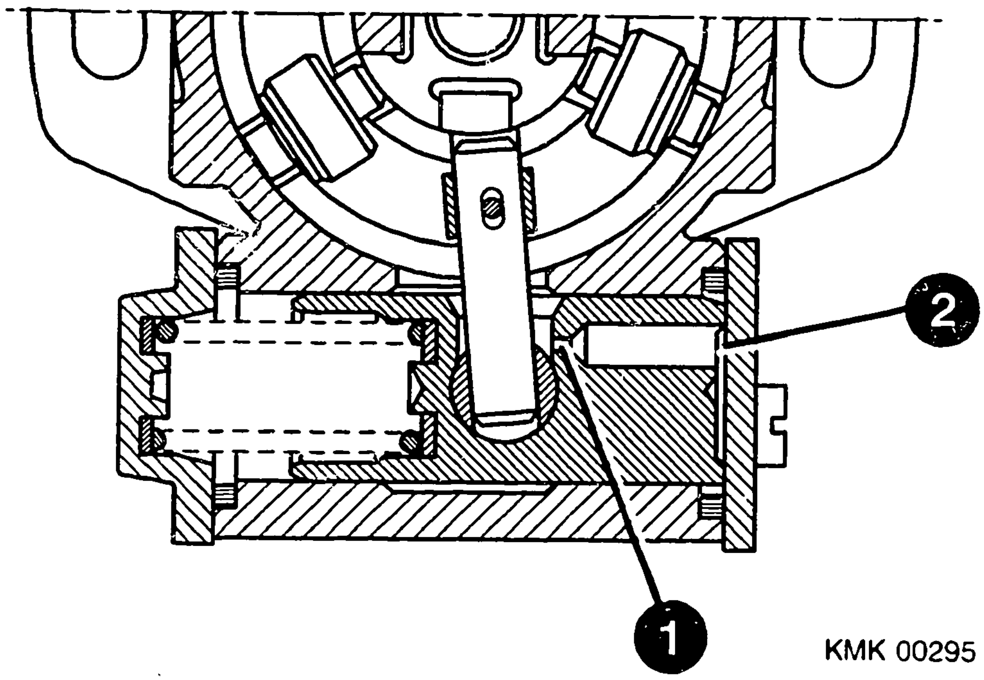
1 = Restriction bore
2 = Pressure side, timing-device piston

Function

The supply pump generates a speed-dependent pressure on the basis of the pressure-regulator control.

This pressure (internal pump pressure) is the control quantity for the timing device.

With the standard timing device, the fuel flows via the restriction bore to the pressure side of the timing-device piston.

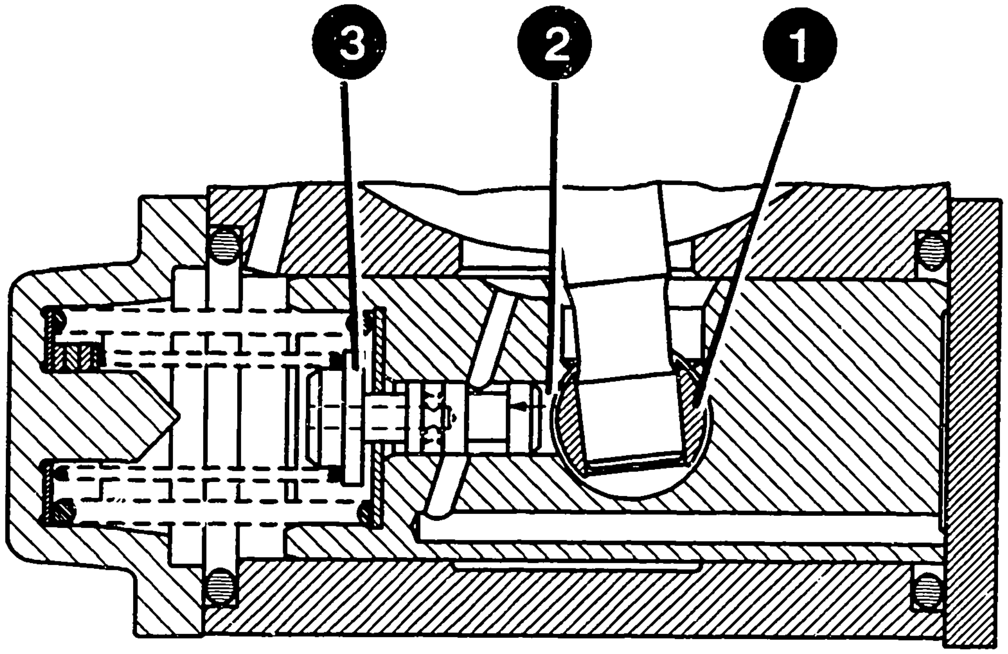


KMK 00295

This causes the piston to move to the left against the spring force.
A higher internal pump pressure results in "advance" and a lower pressure in "retard".

1 = Sliding piece with ring groove (inlet)
2 = Control-plunger pressure side
3 = Control plunger

When use is made of a timing device with follower piston, the pressure inside the pump does not act directly on the pressure side of the piston, but rather it is applied by way of the sliding piece with ring groove to the control-plunger pressure side and causes the control plunger to move to the left.

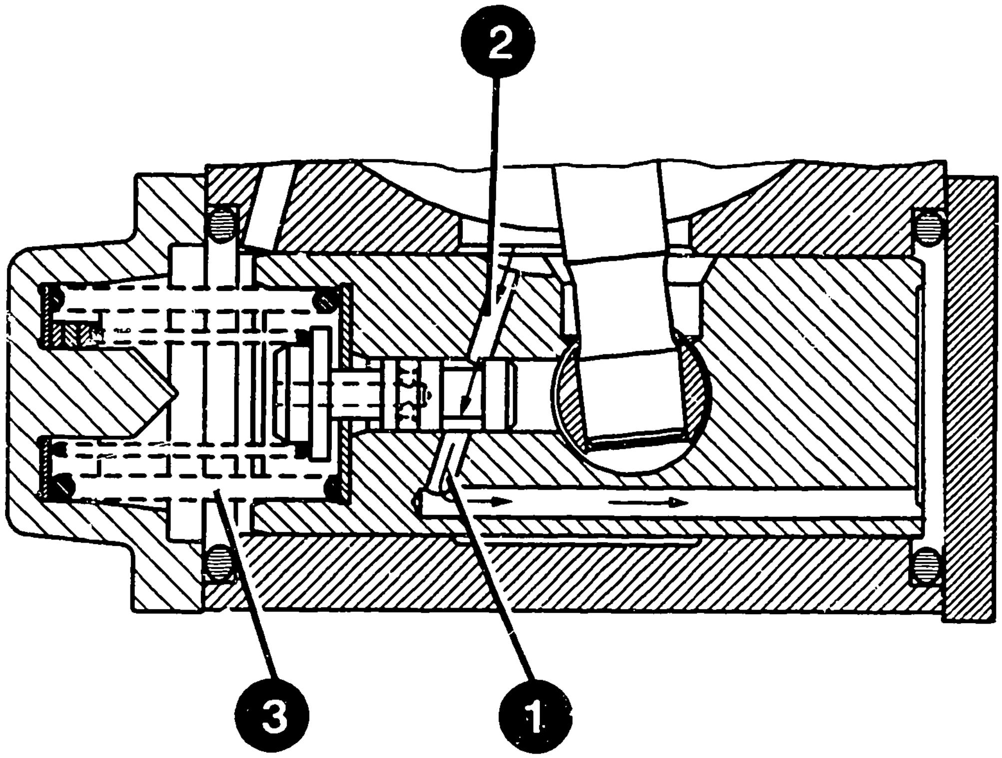


KMK 00296

1 = Spill port
2 = Inlet port
3 = Timing-device return spring

The spill port is opened in the process and the fuel flows via the inlet port, spill port to the pressure side of the timing-device piston.

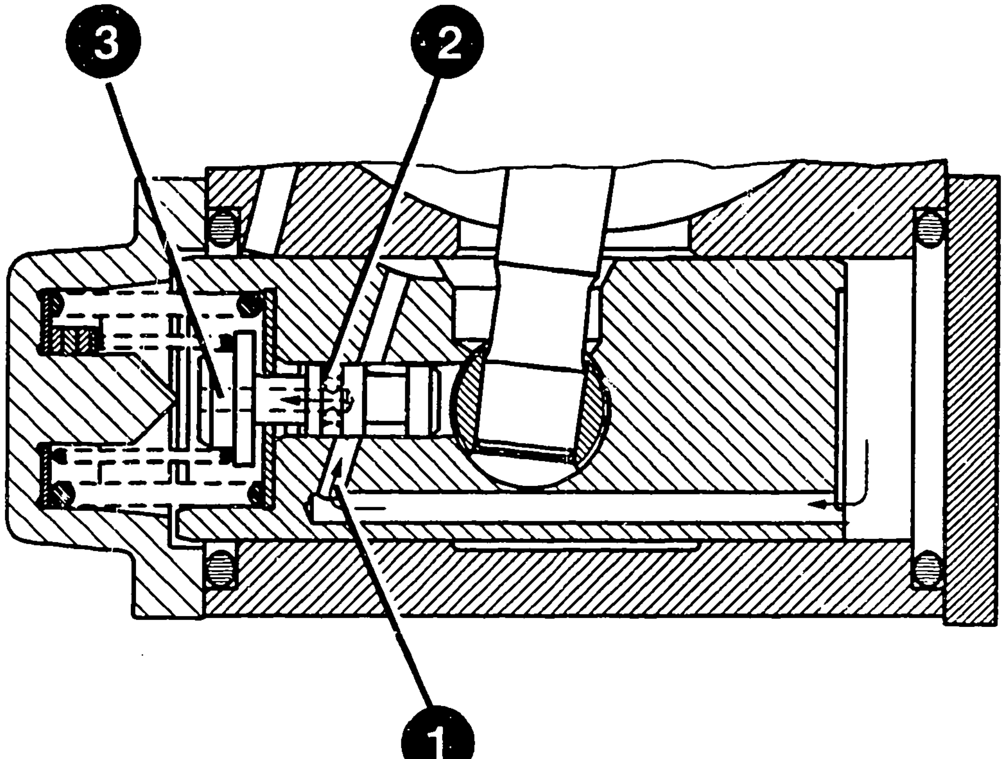
The resultant internal pump pressure advances the timing-device piston (against timing-device return piston) until inlet port is sealed off again. This procedure is repeated after every change in pressure.



KMK 00297

1 = Spill port
2 = Transverse port
3 = Longitudinal port

With decreasing pressure inside the pump, the control plunger in the timing-device piston moves to the right.
This opens up the transverse port in the control plunger.
The pressure in the high-pressure area is dissipated to the spring chamber by way of spill port, transverse port and longitudinal port. The timing-device return spring "retards" the timing-device piston (moves it to the right) until the spill port is opened up and a stable condition is achieved.



KMK 00298

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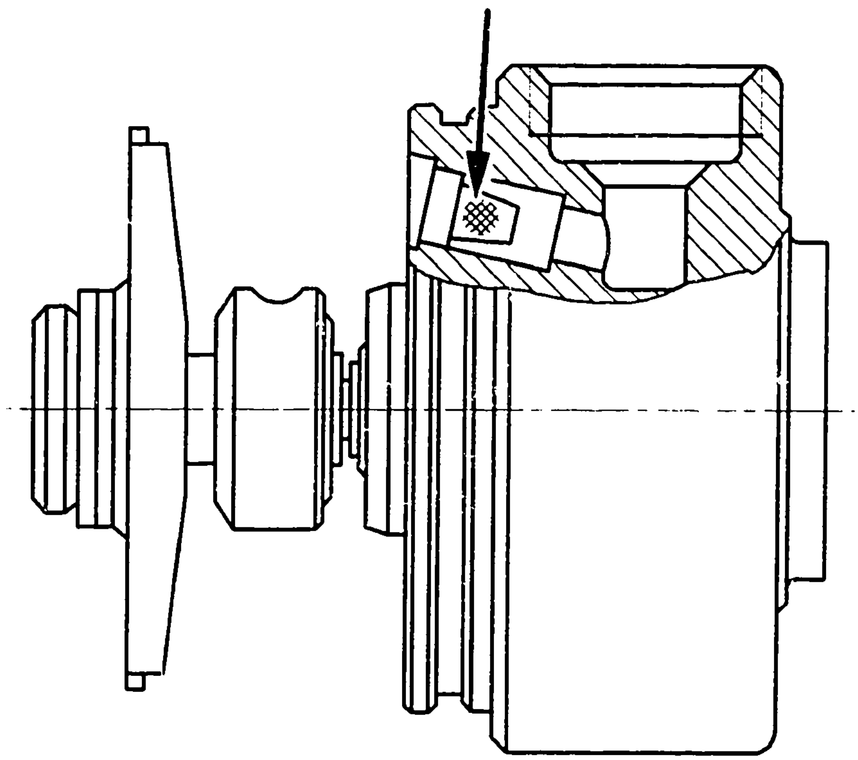
DISTRIBUTOR-TYPE FUEL-INJECTION PUMP VE..F
DISTRIBUTOR HEAD WITH STRAINER UPSTREAM OF SHUTOFF SOLENOID

Workshop: EP
08.1990
0242 En

In order to prevent dirt getting into the high-pressure area from the inside of the pump, a strainer (arrow) has been fitted for the first time on the VE..R170 in the inlet port of the distributor head.

In the event of contamination, blow out strainer by way of central screw plug.



KMK 00292

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P-PUMPS WITH MECHANICAL/ ELECTRONIC CONTROL

Workshop: EP
08.1990
0246 En

Control-rod support, service information

GENERAL

Various size P fuel-injection pumps feature control-rod support in the center of the pump housing. This applies to 10 and 12-cylinder mechanically controlled pumps as well as to all EDC versions as of the start of 1990.

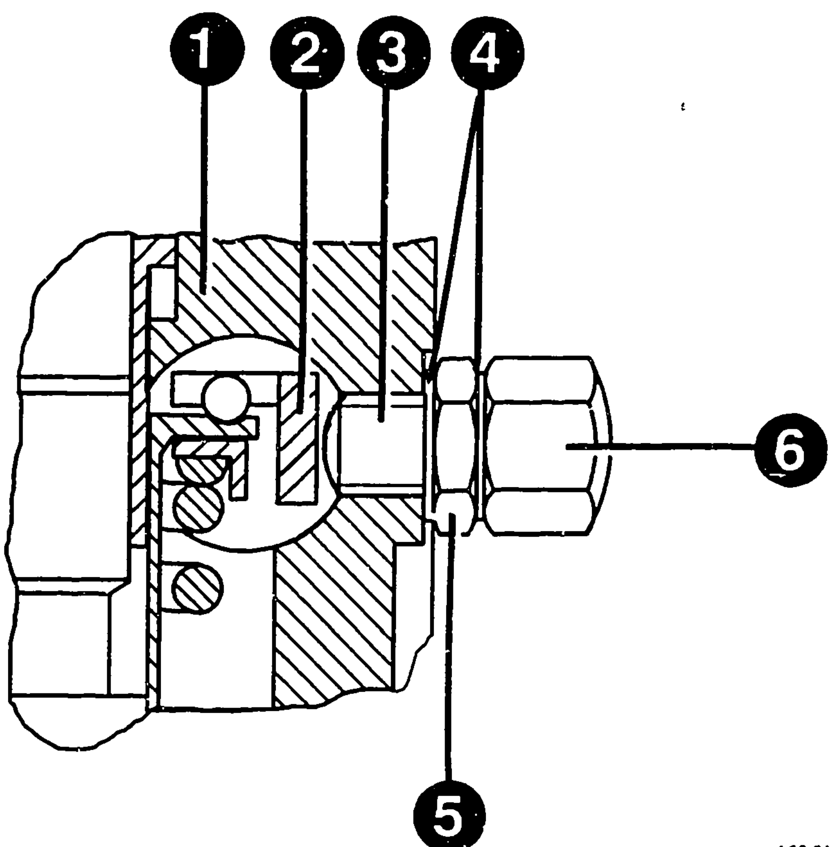
The support is designed to restrict transverse control-rod vibration and thus to prevent fracture of the control rod.

VERSIONS

There are 2 types of control-rod support:

1. One-sided support by means of threaded pin (see bottom ill.). This solution is featured only on EDC pumps and is to be gradually replaced (depending on version) by the end of 1990 with the ring-groove support on the following pages.

1 = Pump housing	2 = Control rod
3 = Setting pin	4 = Seal rings
5 = Lock nut	6 = Cap nut



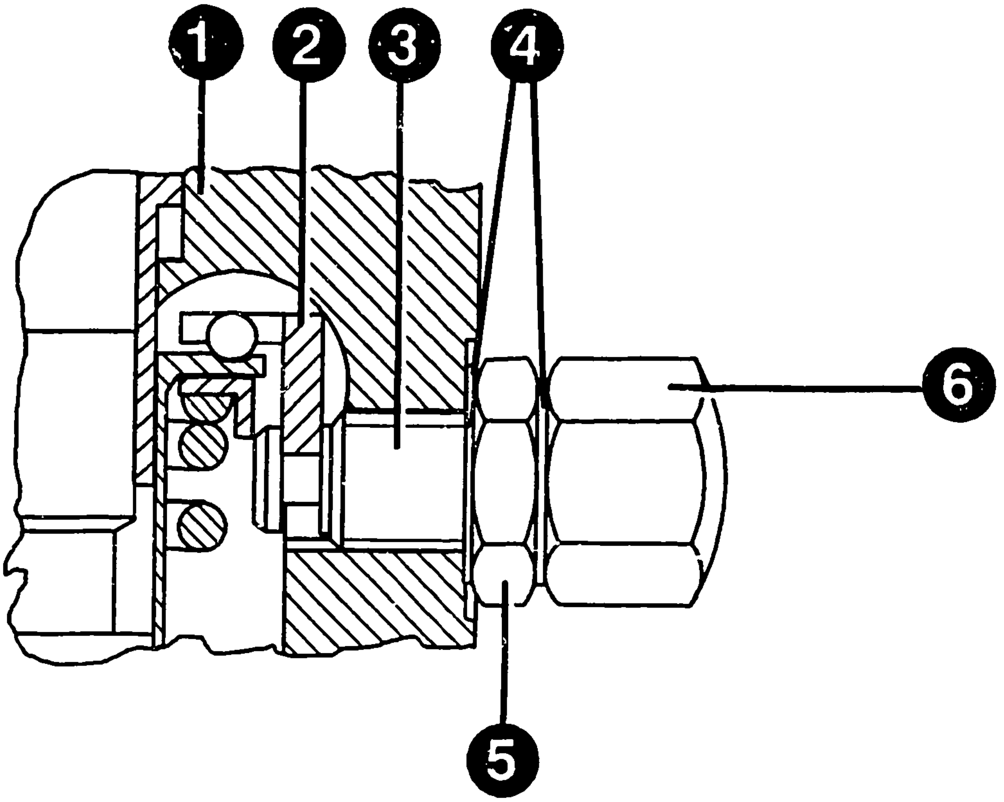
KMK00428

VERSIONS (continued)

2. Ring-groove support (refer to bottom picture). Version for mechanically controlled 10 and 12-cylinder pumps as well as all EDC pumps as of the end of 1990.

   Note: The setting pin (ring-groove pin) in this version can only be screwed out after the control rod has been removed.

1 = Pump housing
2 = Control rod
3 = Setting pin
4 = Seal rings
5 = Lock nut
6 = Cap nut



ADJUSTMENT OF CONTROL-ROD SUPPORT

The support must be set at rest position of the control rod (pump stopped) such that there is no control-rod contact, i.e. the control rod must be free.

Re-adjustment of the support is only necessary in the event of uncertainty or if control rod and/or control-rod bearing has/have been replaced.

Use new seal rings after loosening cap nut and lock nut.

Both versions are set with approx. 13 mm control-rod travel (control-rod-travel adjustment by means of current regulation, refer to test instructions).

Adjustment procedure, one-sided support:

Screw in setting pin until it makes contact with control rod. Contact is recognized on pump drive end by means of movement of control rod in bearing.

Then screw back setting pin by one quarter of a turn, lock and screw on cap nut.
Tightening torque
for cap nut and lock nut: 12...15 Nm.

Adjustment procedure, ring-groove support:

Screw in/screw out setting pin in both directions until contact is made with control rod.

Contact is recognized on pump drive end by way of movement of control rod in bearing.

Then turn pin to center position from both stops, lock and screw on cap nut. Tightening torque for cap nut and lock nut: 12...15 Nm.

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Renewal of quantity actuator

The quantity actuator chiefly consists of the following components

* Actuator
* Control-collar travel sensor
* Fuel temperature sensor

The quantity actuator is a self-contained unit and may only be replaced as a c o m p l e t e assembly.

Exception:
The fuel temperature sensor is the only component of the quantity actuator which can be exchanged.

At incoming-repair stage, ensure that all fuel-injection-pump faults/fault symptoms, which led to the fuel-injection pump being removed, are queried.

Renew the quantity actuator if the fuel-injection pump was removed on account of the fault symptoms:
* Bucking and black smoke with subsequent engine stop or
* Bucking during warm-up phase and at part load; bursts of black smoke

Renewal of quantity actuator

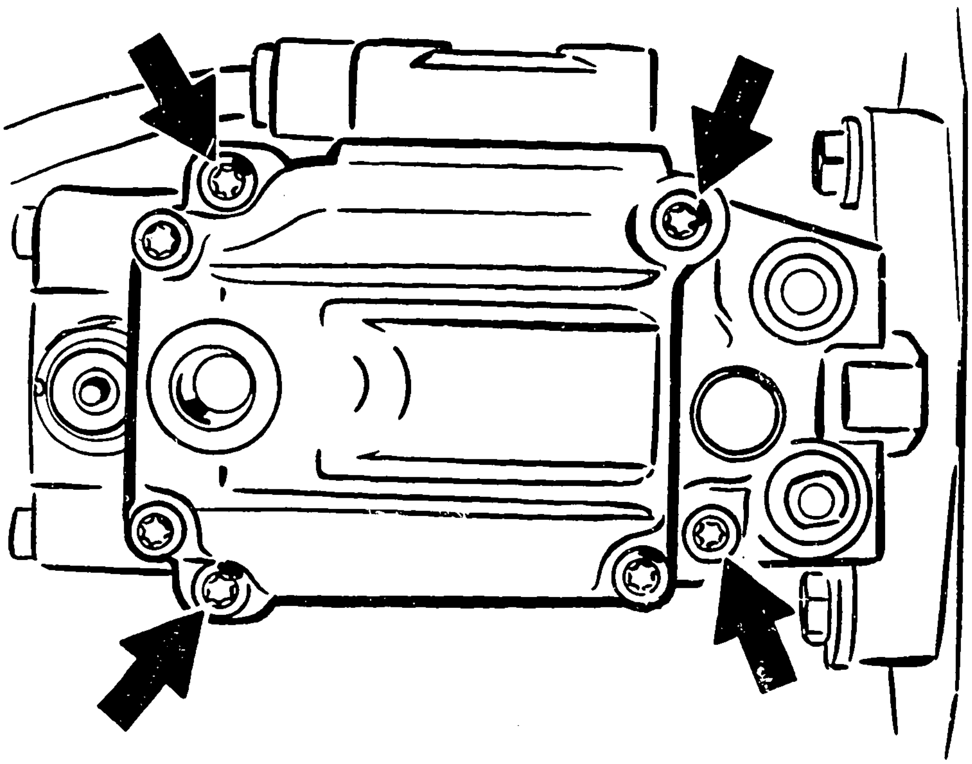
The quantity actuator may only be renewed following fuel-injection pump removal.

Carry out incoming inspection in accordance with testing instructions for VE..E.. distributor-type fuel-injection pumps.

Pay attention to safety and precautionary measures!

Remove calibrating-oil return line.
Separate connecting cable of quantity actuator at pump.

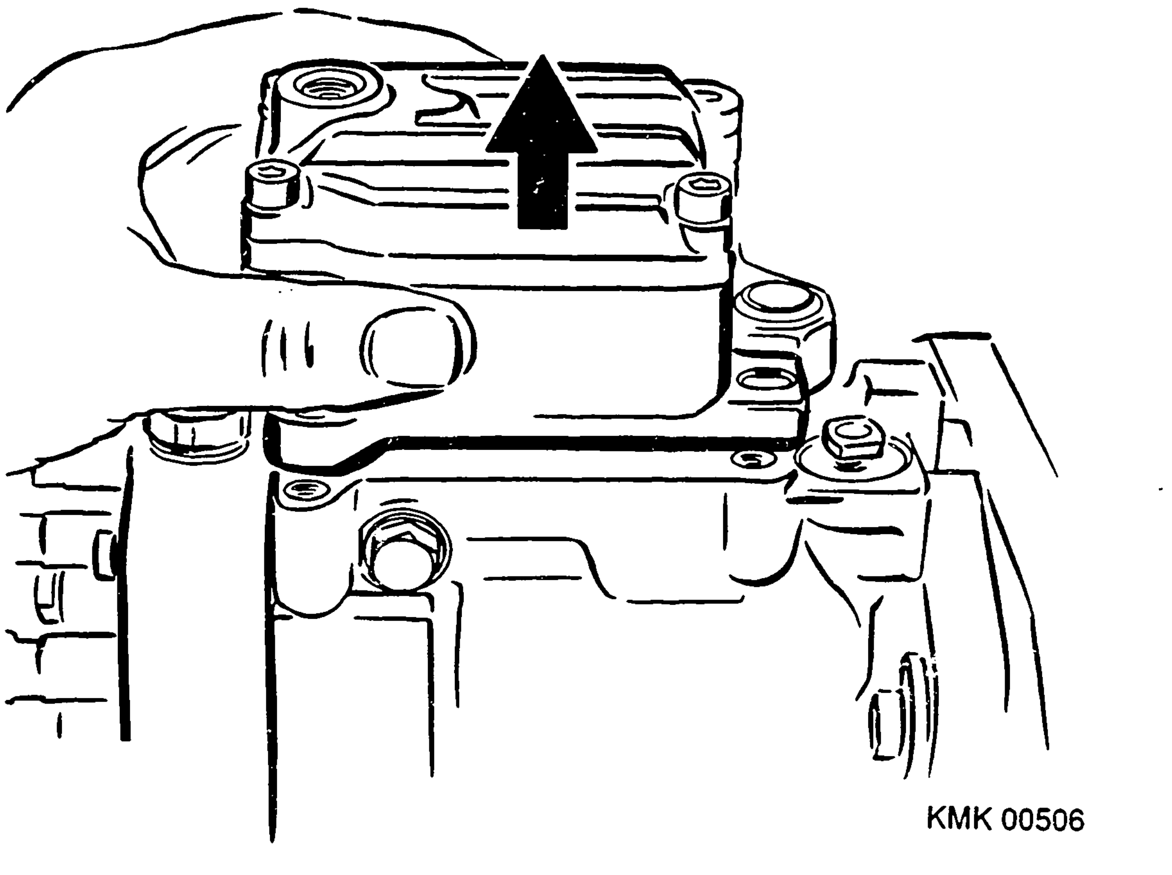
Screw out fastening screws (picture, arrow).



KMK 00505

Lift off quantity actuator perpendicularly from pump housing.

If quantity actuator won't move, tap gently on end face with plastic hammer.



KMK 00506

Unscrew electric shutoff device (ELAB).
Visually inspect strainer of quantity actuator.
If contamination or metallic deposits is/are discovered at the armature of the ELAB and/or at the strainer of the quantity actuator, the fuel-injection pump is to be disassembled and cleaned.
Make use of repair instructions for VE..F.. distributor-type fuel-injection pumps.

Attach new quantity actuator to cylinder block. (Renew rubber seal).
Make sure that the spherical bolt of the setting shaft engages in the control-collar hole.
Center fastening screws in slots in quantity actuator and tighten slightly by hand (squeeze seal until sealing surfaces are on top of one another).
Attach calibrating-oil return line.
Connect up quantity actuator to connecting cable of quantity actuator.

Adjust fuel-injection pump in accordance with testing instructions for VE..E.. distributor-type fuel-injection pump.
Following completion of test procedure, apply locking compound to fastening screws.

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Anti-tamper safeguard (lead seal) on pumps for Cummins

Following repair and/or adjustment on pump test bench, VE..F.. distributor-type fuel-injection pumps for Cummins must be sealed with sealing caps at the:

* Full-load adjusting screw
* and the rated-speed adjusting screw.

The sealing caps for the full-load adjusting screw and upper rated speed are red, so as to make it possible at any time to establish whether adjustment correction has been carried out on a VE pump.

As opposed to the Service Department, the factory uses black sealing caps with different part numbers.

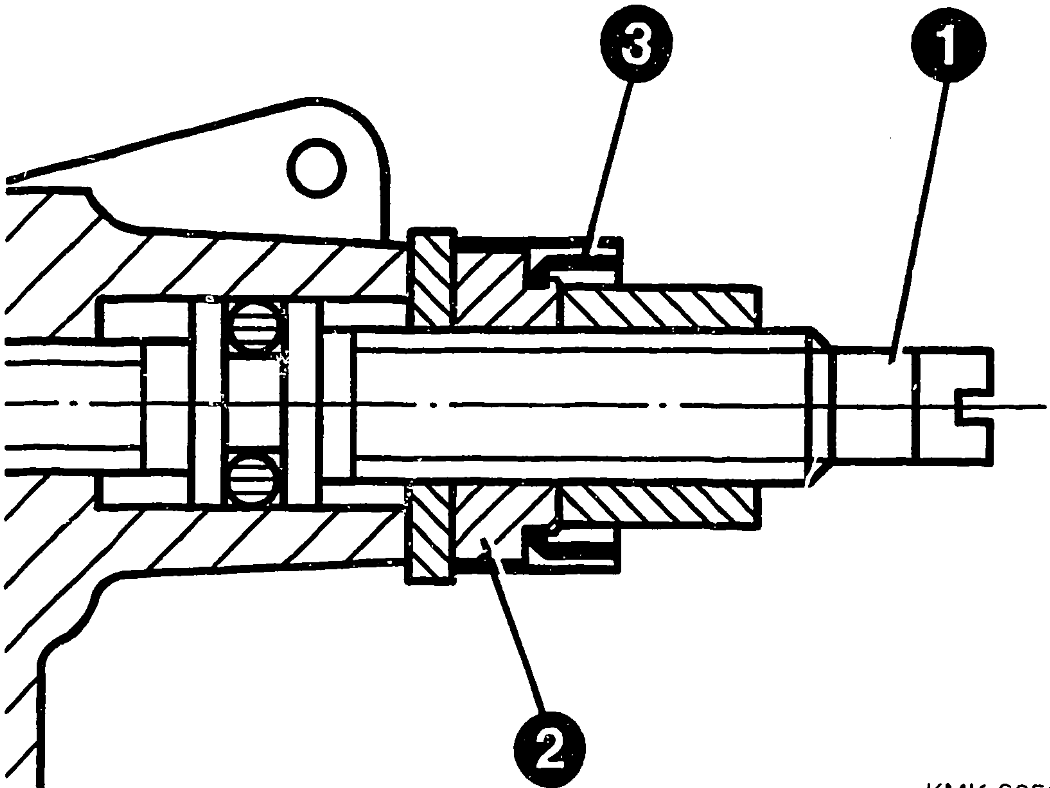
1 = Full-load adjusting screw
2 = Lock nut with identification groove
3 = Sealing cap

Full-load adjusting screw:

Hexagon nut M8	Sealing cap (red)
1 463 315 306	1 460 591 313

Adjusting screw, upper rated speed:

Hexagon nut M6	Sealing cap (red)
1 463 315 307	1 460 591 312



KMK 00504

Press on sealing cap as follows:

Hold inside diameter of sealing cap in sealing tool.
Press sealing cap with assembly tool into groove in lock nut.
Sealing cap must engage.

Tools required:

* KDEP 1187 for full-load adjusting screw
* KDEP 1188 for rated-speed adjusting screw

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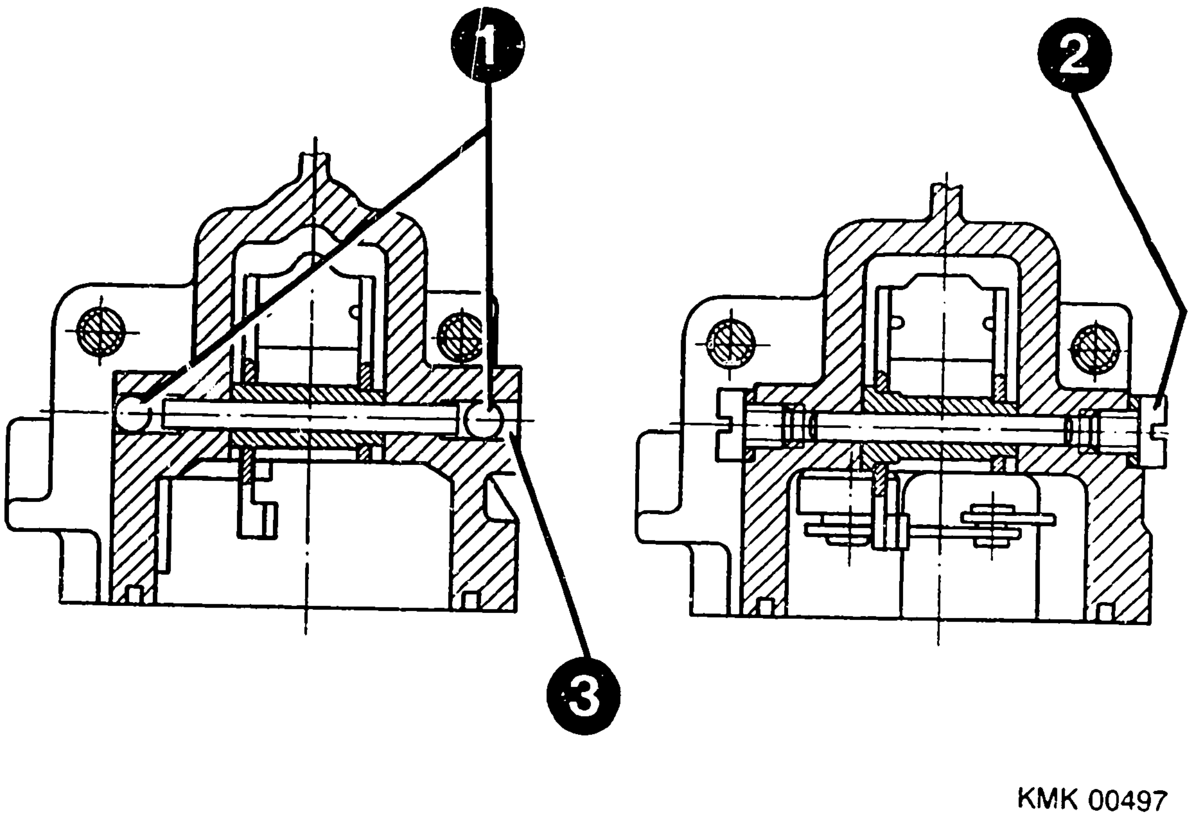
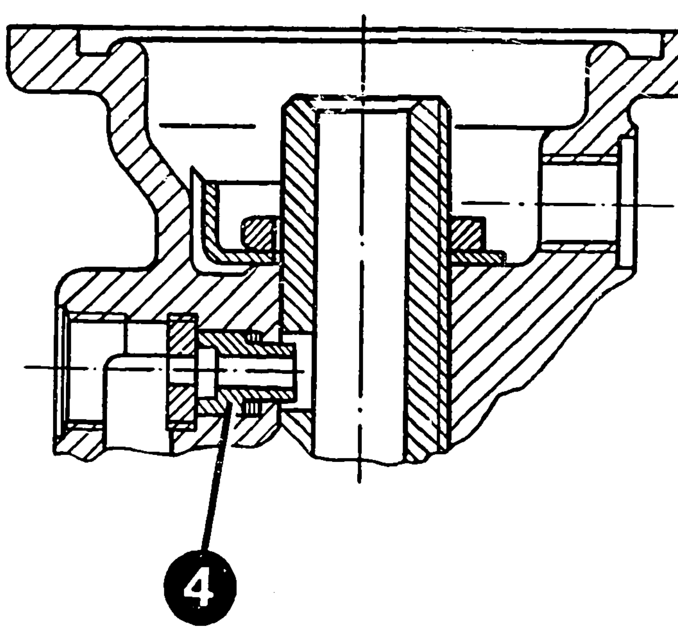
LDA/HBA housing repair

The LDA/HBA housing with spherical seal differs from the previous version as follows:

1 = Sealing of bearing-pin bore of control lever by means of pressed-in balls.
2 = No fillister-head screw and flat seal ring
3 = Stepped bearing-pin bore.



4 = Bushing for guide pin with hexagon-
socket screw plug 4.5 mm



KMK 00498

TOOLS REQUIRED

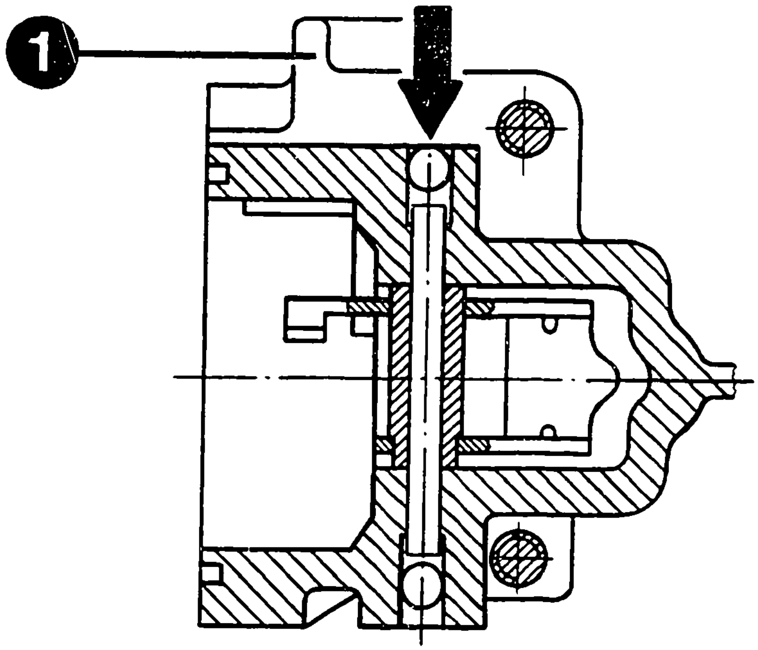
Assembly device Installing LDA/HBA stop housing	KDEP 1182
Pressing-in mandrel Pressing in balls	KDEP 1183
Twist drill Enlarging bearing-pin bore	KDEP 1184
Fitting mandrel Knocking in spring retainers	KDEP 1185
Machine reamer 8 H7	commercially available

1 = Cast-iron boss

Install LDA/HBA stop housing on assembly tool KDEP 1182.

Position assembly tool on plate of mandrel press such that ball in raised cast-iron boss of LDA/HBA housing faces upwards.
Use pressing-in mandrel KDEP 1183 to press ball into bearing-pin bore as far as it will go.
Pressing-in depth of ball approx. 4.0 mm.

Use twist drill KDEP 1184 to enlarge hole as far as ball (approx. 2.5 mm)



KMK 00499

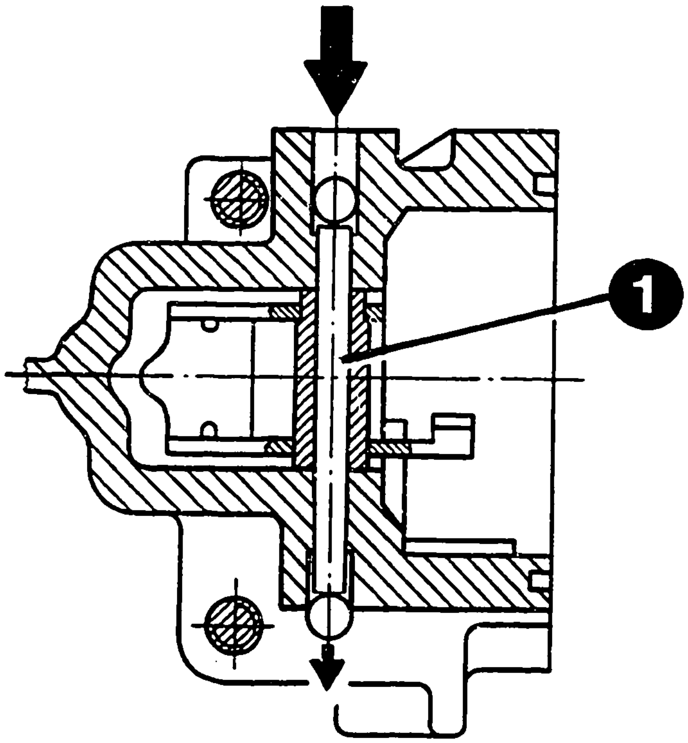
1 = Straight pin

Turn assembly tool and press in opposite ball until ball on enlarged side drops out.

Knock out straight pin.

Disassemble LDA/HBA housing as far as removal of bushing.
Remove hexagon-socket-head cap screw and take O-ring out of bushing.

Further disassemble LDA/HBA housing in accordance with repair instructions.

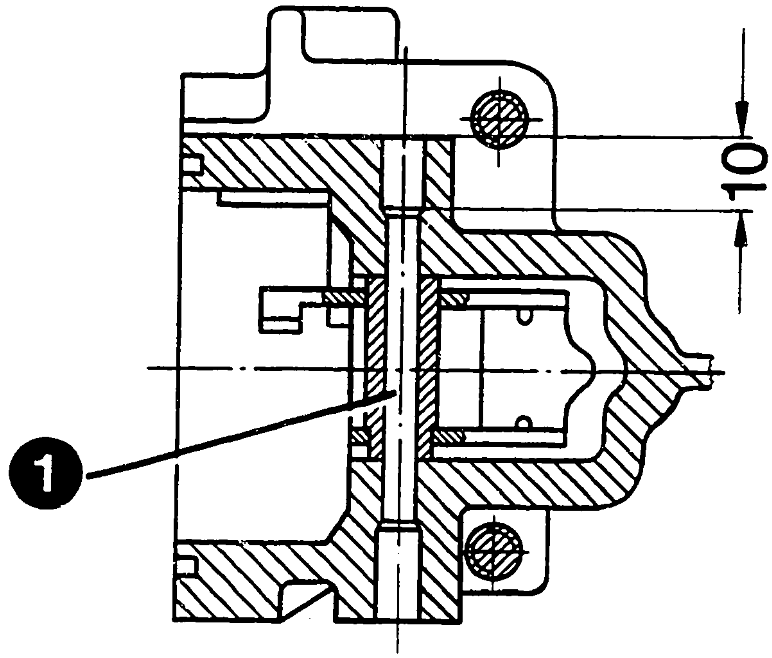


KMK 00500

1 = Control-lever-bearing ball

Enlarge both bores with twist drill KDEP 1184 until control-lever-bearing bore approx. 10 mm deep.

Ream bores with machine reamer 8 H7.
Replace damaged/defective parts.
(e.g. O-Ring at guide pin)



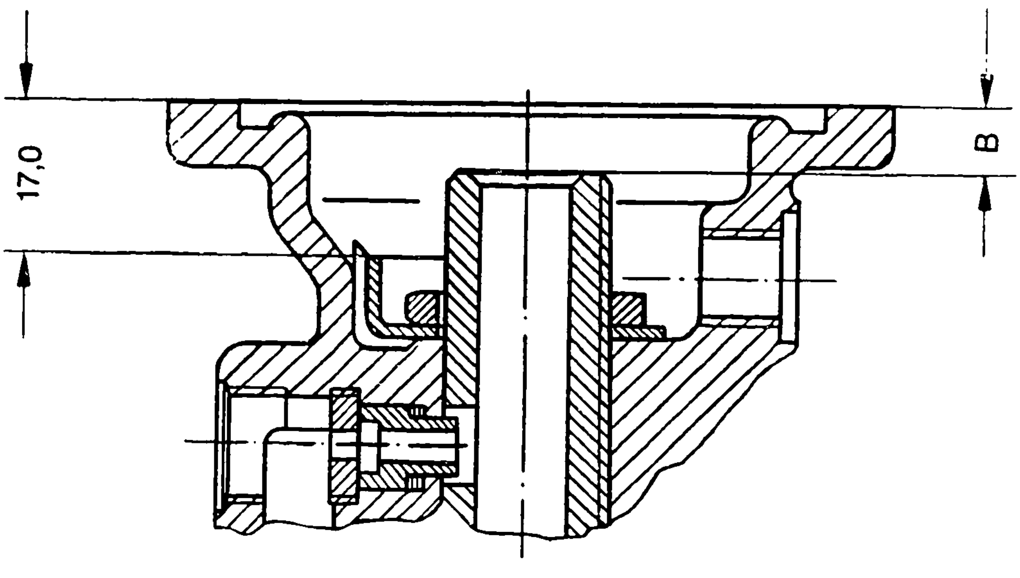
KMK 00501

LDA/HBA HOUSING ASSEMBLY

Pay attention to differences with respect to repair instructions:

Assemble LDA/HBA in line with repair instructions as far as Section: "Screwing in bushing and adjusting nut:"

* = Adjustment dimension of bushing
  Dimension B = 12.5 mm
* = Adjustment dimension of adjusting nut
  = 17.0 mm

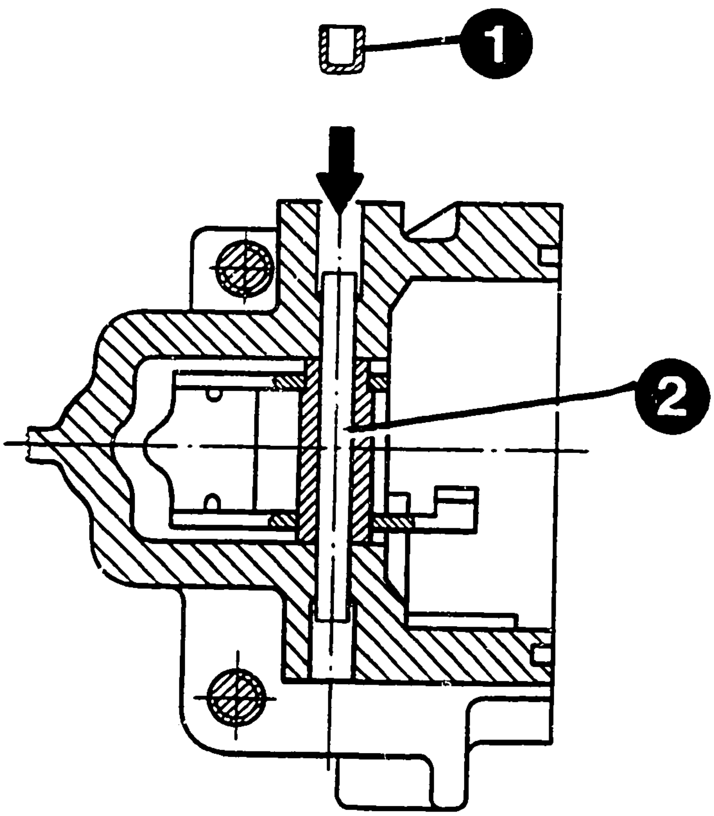


KMK 00502

1 = Spring retainer
2 = Straight pin

Following completion of LDA/HBA repair, seal ball sealing hole with spring retainers 1 420 505 040.

Apply small quantity of Loctite 582 to periphery of spring retainer and knock in with fitting mandrel KDEP 1185.



KMK 00503

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VE INJECTION PUMPS
IN CUMMINS-ENGINES

Workshop: EP
12.1990
0256 En

Drive shaft seal

When replacing the drive shaft seal on the subject injection pumps, seal 1 460 283 302 is no longer to be used.

Instead use only seal 1 460 283 307 for all Cummins VE-pumps with drive shaft diameter 20 mm.

The serie production has changed over to seal 1 460 283 307 in Febr. 1990 (Manufacturing Code 062).

The affected parts lists will be updated subsequently.

The seal 1 460 283 302 (old) can be recognised also be the black colour of its plastic, the new seal has green plastic.

However, the seal 1 460 283 302 with black plastic remains valid and in use for other applications than Cummins.

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8-CYLINDER MW
FUEL-INJECTION PUMPS

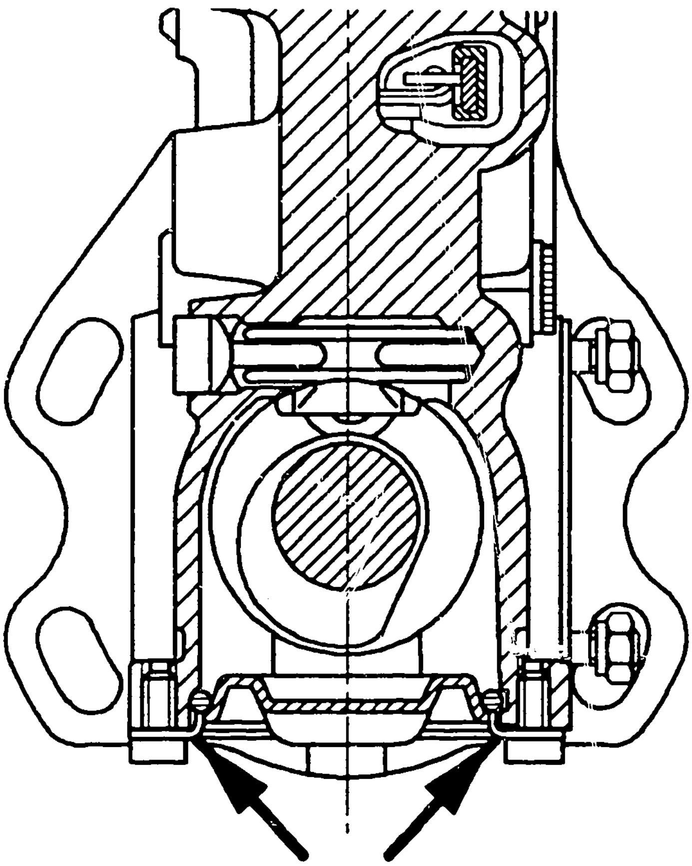
Workshop: EP
12.1990
0258 En

Leaking base-cover seal

Leaks may occur at the base cover on the governor end of 8-cylinder MW fuel-injection pumps manufactured in the period FD 845 - FD 850.
Such leaks are caused by crushed seal rings.

Crushing is the result of incorrect spacing between the cover sealing surface and the housing sealing surface.

The date of manufacture of the fuel-injection pump is to be checked if base-cover leakage is detected. The cover seal is to be renewed and modified claws employed if the date of manufacture is in the period 845 – 850. The surface of the claws (see picture – arrows) is black and they can be obtained by telephone from KH/VKD2 under the Part No. C 403 510 167.



KMK 00571

Outside Germany, please direct enquiries to your local Bosch representative.

The work is to be performed free of charge.

The procedure initially described is not to be employed if black claws have already been fitted.

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DISENGAGED CONTROL SLEEVES

Workshop: EP
12.1990
0259 En

on 8-cylinder MW in-line pumps with pneumatic shutoff device (KHD attachment)

After switching off the engine or operating the engine brake, the control rod may remain in the shutoff position.

The engine cannot be re-started.

The control sleeves of the u n e v e n cylinders may become disengaged from the control-rod linkage on account of the high acceleration forces occurring when the pneumatic shutoff device is actuated.

Repair instructions:

Check control sleeves of uneven cylinders for wear and deformation after removing fuel-injection pump.

Replace damaged control sleeves.

The control rod is to be renewed.

Then completely adjust injection-pump assembly.

The work is to be performed free of charge.

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TESTING OF P-PUMP ASSEMBLIES
with plunger diameter
12.0 mm and above

Workshop: EP
12.1990
0260 En

Test specifications are provided in the microcards WP.. for testing and adjusting several injection-pump assemblies of size P with plunger diameter 12.0 mm and above (with the exception of series ..S 7000 and ..S 7100/7800).

Test specifications, which do not contain any information about the calibrating nozzle-holder assemblies and test-pressure lines to be used, apply to the calibrating nozzle-holder assemblies, size "T" with the part number 0 681 443 022 and the corresponding test-pressure line 1 680 750 060 or 1 680 750 061 (8.00 x 2.00 x 1000 mm).

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MACK WITH
PES..P..PUMPS

Motor vehicle: FZD
and workshop: EP
12.1990
0261 En

Test specifications
with high consumption and/or lack of power

Test specifications for checking the serviceability of engine nozzle-and-holder assemblies are now being published on microcards WP.. as part of test specifications for injection-pump assemblies of size "P" from Diesel engines manufactured by MACK (USA).

These test specifications have been incorporated in the values for fuel-delivery characteristics" and are marked with "*".
By way of explanation, the following text is to be included under "Remarks":
"*" This test specification only applies to the checking of engine nozzle-and-holder assemblies on an injection-pump test bench: Setting test equipment, check value to engine equipment".

Explanation:
In the event of customer complaints regarding lack of power and/or high fuel consumption, the injection-pump assembly is first to be clamped in position on the injection-pump test bench and then tested on the basis of the check values (test specifications in brackets) and adjusted if necessary to the required values.
If the injection-pump assembly is not incorrectly set, the fault may also be in the engine nozzle-and-holder assemblies. These are then to be removed from the engine and carefully cleaned in an ultrasonic bath.

Check opening pressure on nozzle test bench and adjust to prescribed pressure if necessary.
Further procedure:
Operate injection-pump assembly at test-specification speed marked with "*" in fuel-delivery characteristics.
Move control rod until delivery not in brackets is attained with prescribed calibrating nozzle-holder assembly.
Note down this control-rod travel.

Insert engine nozzle-and-holder assembly in place of calibrating nozzle-holder assembly into corresponding holder in graduate mount and connect by way of test-pressure line 9 681 230 730 to injection-pump assembly. Operate injection-pump assembly again at same speed and adjust control rod to previously determined control-rod travel. To test the engine nozzle-and-holder assemblies, the test specifications marked with "*" in brackets must now be attained.
If they are attained, there is no fault in the engine nozzle-and-holder assemblies.

If values outside the prescribed test specifications are attained, the existing used nozzles in the engine nozzle-and-holder assemblies are to be replaced with new ones and the engine nozzle-and-holder assemblies are to be re-checked.
The costs of the entire test are always to be billed, even during the warranty period.

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FUEL-INJECTION PUMP P10
Leakage at delivery-valve holder

Workshop: EP
12.1990
0263 En

Leakage at the delivery-valve holder on fuel-injection pumps of size P 10 can only occur in the event of a damaged O-ring beneath the thread M30x1. Secure tightening of the delivery-valve holder cannot eliminate the leak again; for this reason no attempt should be made to re-tighten in the event of a leak.

Furthermore, re-tightening with an excessive tightening torque can damage the plunger-and-barrel assembly. This may result in engine damage. The following procedure is to be adopted in the event of leaks at delivery-valve holders with M30x1 thread:

Remove delivery-valve holder, upper seal ring with bead, delivery-valve assembly and lower flat seal ring.

Scrap both seal rings and O-ring.

Clean delivery-valve assembly and delivery-valve holder and check for damage. Protect assembly bushing against contamination. Scrap damaged parts and replace them with new ones.

Fit new O-ring 9 900 362 574.

Lubricate sealing lug of delivery-valve holder, M30x1 thread and O-ring.

Install new flat seal ring 9 413 360 715 (I.D.20 mm), delivery-valve assembly and new seal ring with bead 9 413 360 702.

Install delivery-valve holder M30x1 and tighten to 180...200 Nm. Loosen and tighten again to 180...200 Nm. Loosen again, tighten to 38...42 Nm and finally re-tighten to 20...21 degree angle. During this re-tightening process, the tightening torque must not exceed 250 Nm.

If a tightening torque of 250 Nm is exceeded, all seals must be renewed again and the entire tightening procedure repeated. If the maximum permissible tightening torque is then exceeded again, the complete barrel-and-valve assembly must be scrapped.

Once the delivery-valve holder has been tightened as prescribed, the positioning key 9 413 360 379 must always be fitted.

Important:

If the fuel-injection pump has been varnished by the engine manufacturer, the varnish must be removed from the flange of the plunger-and-barrel assembly where the key makes contact.

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The following calibrating oils for fuel-injection pumps are approved by BOSCH:

* SHELL Calibration Fluid S 9365 (Shell International)

* SHELL V-oil 1404 (Shell Germany)

* SHELL Normafluid B.R. (Shell France)

* VISCOR Calibration Fluid 1487 AW-2 (Rock Vallery)

* CASTROL fluido para Calibracao 4113 (Castrol Brazil)

* ESSO EGL 70 147 (Esso AG)

* BENZ UCF-1 Calibration Fluid (Benz Oil)

The following instructions concerning wear protection and the use of the calibrating oil for fuel-injection pumps as per ISO 4113 must be heeded:

Only the calibrating oils listed guarantee the wear protection required by us.

Wear protection is crucial in regards to distributor-type fuel-injection pumps.

Our tests demonstrate clearly beyond any doubt that the use of calibrating oils, the wear protection of which does not correspond to our requirements, can result in premature wear when running in pumps both when new and following repair. Depending on subsequent loading, this may lead to premature pump failure.

Other companies, such as Mercedes-Benz AG, release calibrating oils which are not in line with our strict wear-prevention requirements.

Reason:
Mercedes-Benz AG does not install distributor-type fuel-injection pumps in its engines. Calibrating-oil advertising, which makes reference to Mercedes-Benz release, ought to be restricted to in-line pumps, if it is not to ignore the real technical problem. In order to ensure that our quality standards are guaranteed at Service level as well, we hereby stipulate w i t h o u t e x c e p t i o n that use is only to be made of calibrating oils released by us.
We reserve the right to check the above in the event of claims for warranty damage involving distributor-type fuel-injection pumps.

Warranty claims will be rejected in the case of failure due to wear in situations where use was made of calibrating oil other than that released by us.

The following must also be noted:
oils from different suppliers are not to be mixed.

Keep containers thoroughly sealed and store them in well-ventilated rooms.

When performing work - particularly work involving an injection-pump test bench - pay attention to the following regulations:

Never eat, drink or smoke!

Never inhale vapours!

The workplace/work room must be thoroughly vented.
Lengthy inhalation of vapours can cause intoxication or headaches.
Treatment if above symptoms are noticed:

* Fresh air, possible use of oxygen
* Never make use of any substances designed to help circulation!

Prolonged skin contact may cause skin irritation in the case of people with sensitive skins.

Treatment:
Wash hands as often as possible and use protective cream or wear protective gloves.

If eyes are affected, rinse them for several minutes in running water.

Remove clothing immediately if it gets wet.

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8-CYLINDER MW
FUEL-INJECTION PUMPS

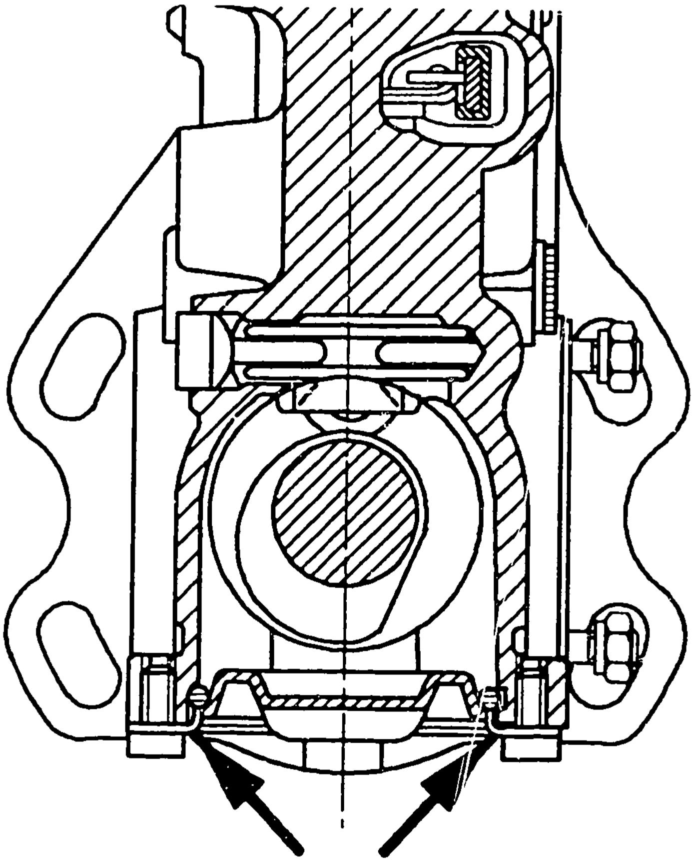
Workshop: EP
12.1990
0258 En

Leaking base-cover seal

Leaks may occur at the base cover on the governor end of 8-cylinder MW fuel-injection pumps manufactured in the period FD 845 - FD 850.
Such leaks are caused by crushed seal rings.

Crushing is the result of incorrect spacing between the cover sealing surface and the housing sealing surface.

The date of manufacture of the fuel-injection pump is to be checked if base-cover leakage is detected. The cover seal is to be renewed and modified claws employed if the date of manufacture is in the period 845 - 850. The surface of the claws (see picture - arrows) is black and they can be obtained by telephone from KH/VKD2 under the Part No. C 403 510 167.



KMK 00571

Please direct questions and comments concerning the contents to our authorized representatives.

The work is to be performed free of charge for the customer within the warranty period.

The warranty situation is to be reported using fault no. 30 and the plain-language text "Base cover leaking as per Service Information".

Time required 5 work units (max.).

If black claws have already been fitted, the procedure initially described dces not apply.

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8-CYLINDER MW
IN-LINE PUMPS

Workshop: EP
02.1991
0259 En

Pneumatic
shutoff device (KHD attachment)
Disengaged control sleeves

The control rod may come to a halt in the stop position after switching off the engine or actuating the engine brake.

The engine can not be re-started.

The control sleeves of the u n e v e n cylinders may become disengaged from the control-rod linkage on account of the high acceleration forces occurring when the pneumatic shutoff device is actuated.

Repair instructions:

After removing the fuel-injection pump, the control sleeves of the cylinders with odd numbers are to be checked for wear and deformation.

Replace damaged control sleeves.

The control rod is to be replaced.

Then adjust the entire fuel-injection-pump assembly.

Within the warranty period, the work is to be performed free of charge for the customer.

The warranty situation is to be reported with fault no. 30 and the plain language text "Control sleeve disengaged as per Service Info".

Time required 86 work units (max.).

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IN-LINE PUMPS
SERIES P-7100

Workshop: EP
02.1991
0270 En

Modification to delivery-valve holder

Delivery-valve holders 2 413 371 197
with spring seat 2 410 120 018
are no longer to be used as of now for service work.

The above-mentioned delivery-valve holder is only encountered in conjunction with a constant-pressure valve (GDV).

Replacement:

Delivery-valve holder	2 413 371 204
Spring seat	2 410 120 019

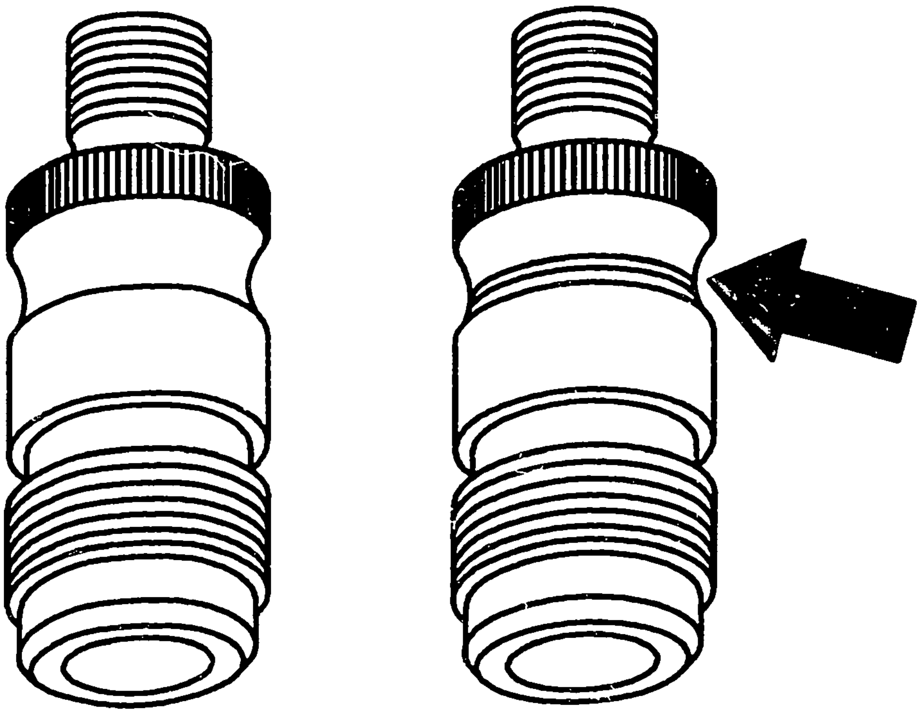
Attention is to be paid to the following items if a delivery-valve holder fails:

* Only replace complete delivery-valve holder and spring seat.

* Fit each pump cylinder with new delivery-valve holders and spring seats.

Delivery-valve holder 2 413 371 204
can be recognized by way of an identification groove beneath the multiple toothing (picture - arrow).

Spring seat 2 410 120 019
is characterized by a larger chamfer.



KMK00803

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IN-LINE PUMPS
SERIES P-7100/P-7800

Workshop: EP
02.1991
0271 En

Modification to intermediate bearing

In order to do justice to increased performance and quality requirements, the intermediate-bearing screw connection is being modified as of date of manufacture 162 and the intermediate bearing itself as of date of manufacture 167 for the above-mentioned pumps.

Intermediate-bearing screw connection (as of date of manufacture 162)

The design feature which distinguishes the new version from the previous screw connection is an expansion sleeve used in place of the seal ring.

Intermediate bearing (as of date of manufacture 167)

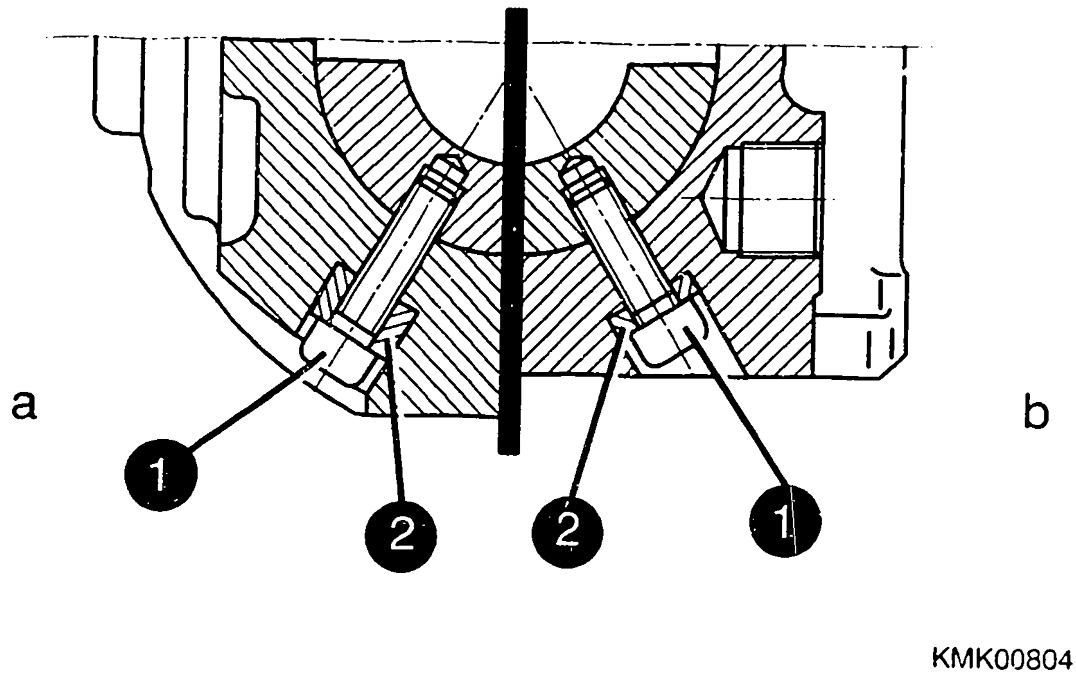
Up to and including 6-cylinder pumps, use is made of the bronze intermediate bearing 2 415 800 024.
The composite steel bearing 2 415 800 020 is employed as of 8-cylinder pumps and above.

Fig. a = Flange/trough version

Fig. b = Flat-bed version

1 = Intermediate-bearing fastening screw

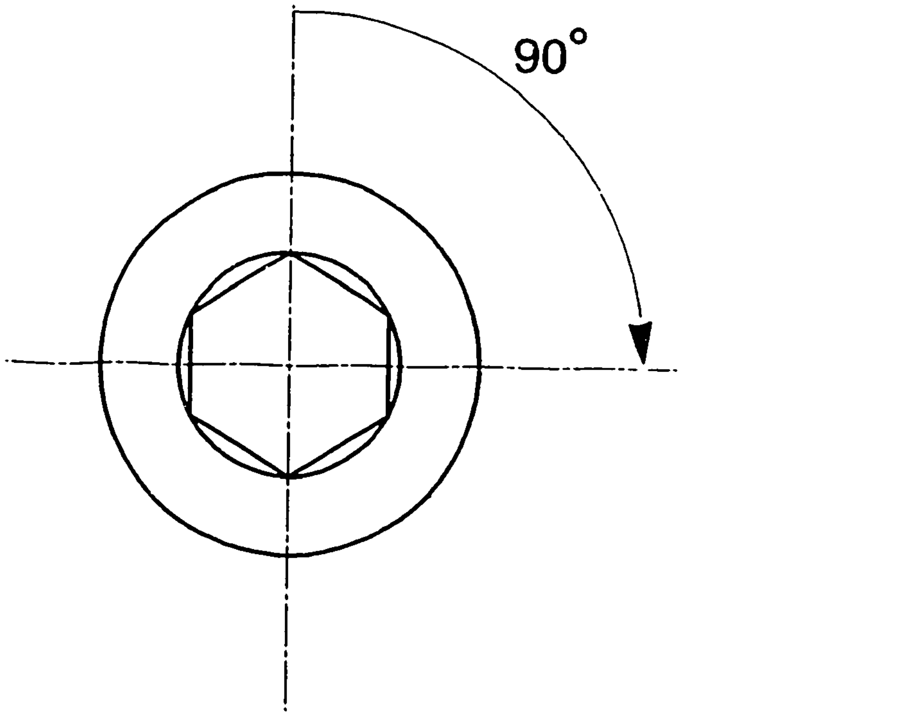
2 = Expansion sleeve



Intermediate-bearing fastening screw

The following procedure must be employed when tightening the intermediate-bearing fastening screws, so as to guarantee screw tightness and freedom from leaks:

* Tighten screws to 7 ... 9 Nm and then turn on a further 90 degrees (picture).



Important assembly instructions:

* Pay attention to cleanliness during assembly procedure.

* There must not be any imperfections or scoring on screw countersinks of pump housing, spacer-sleeve end faces and undersides of screw heads.

* Only ever use fastening screws once.

* The expansion-sleeve connection can not be employed on pumps which previously had an intermediate-bearing screw connection.

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WARRANTY PROCEDURE
FIP VARIANTS
CUMMINS

Workshop: EP
Motor vehicle: FZD
02.1991
0275 En

The warranty procedure was described as follows in the Service Info "Service procedure for fuel-injection-pump variants":

"Incorrect adjustments involving fuel-injection-pump variants with vehicle and engine-manufacturer lead seals are not covered by warranty and likewise not reimbursed by Bosch".

This rule does not apply to Cummins fuel-injection-pump variants. As of now, incorrect adjustments on fuel-injection-pump variants with Cummins lead seals can be handled via Bosch Service Stations in a warranty situation.

Fault 08 is to be reported for incorrect adjustments on fuel-injection-pump variants with Cummins lead seals in the event of a warranty situation.

With the exception of the indication of the fault 08, fuel-injection-pump variants for Cummins are thus to be treated in the same manner as basic pumps (Bosch standard pumps).

The familiar warranty procedure for fuel-injection-pump variants remains valid for other customers who make use of the basic-pump concept.

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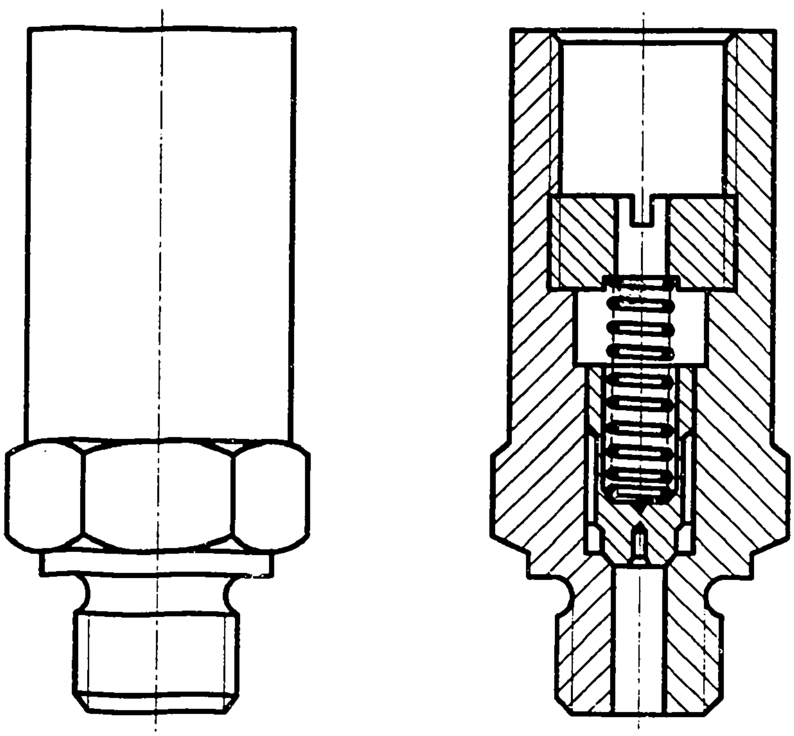
ACCUMULATOR OVERFLOW VALVE FOR SERIES IN-LINE PUMPS

Workshop: EP
06.1991
0277 En

The introduction of the accumulator overflow valve makes for the following advantages:

* stable pressure inside pump

* very little wear at accumulator overflow valve

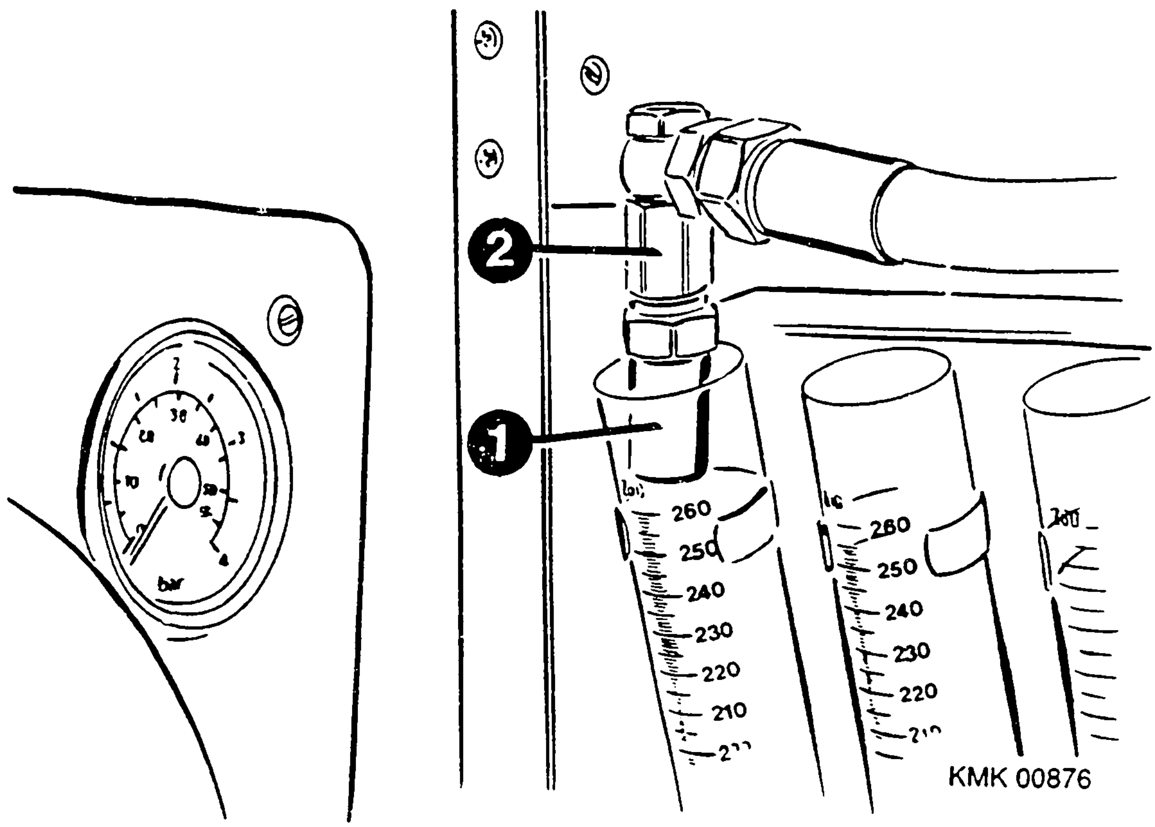


KMK00875

Leak test:

Connect accumulator overflow valve (1) in conjunction with long nut KDEP 1764 (2) to fuel inlet of pump test bench. Suspend accumulator overflow valve in graduate. Increase inlet pressure until valve is heard to open. Reduce inlet pressure to prescribed test pressure. Suspend accumulator overflow valve in clean graduate and switch off test pressure after 1 minute.

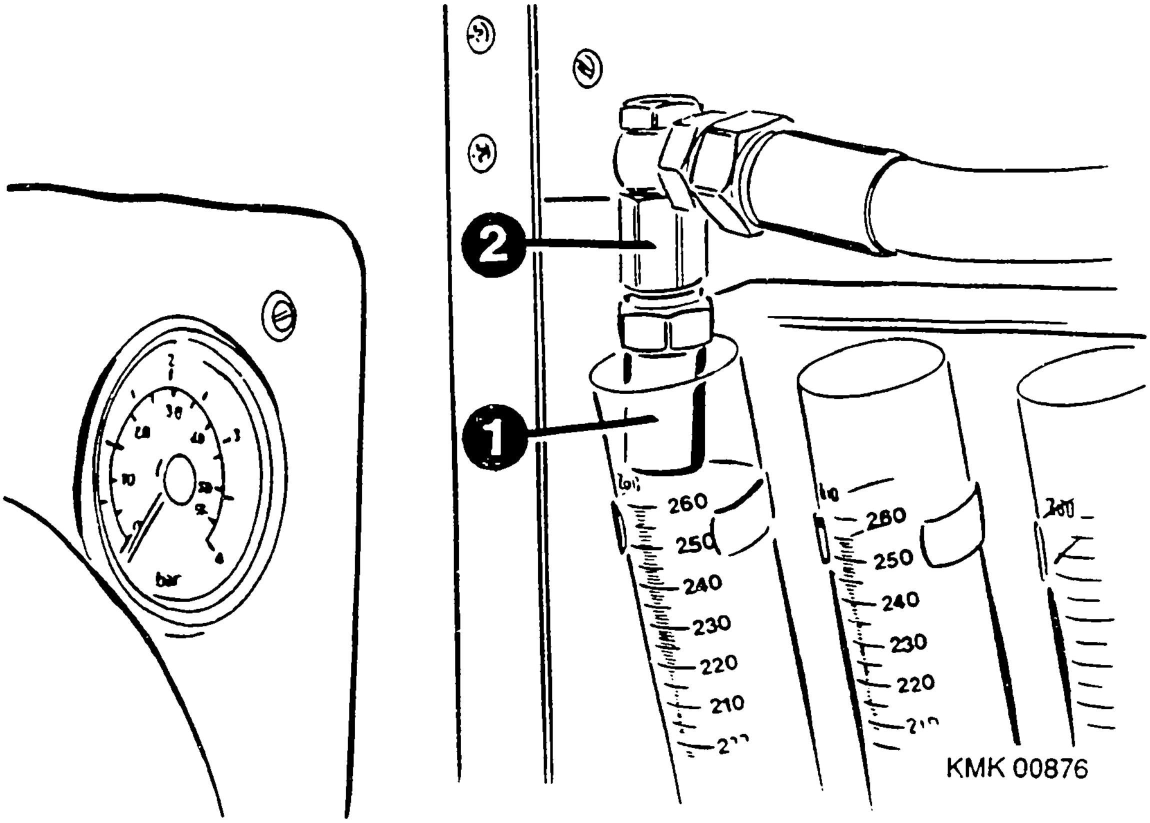
The leakage rate determined must not be greater than the prescribed leakage rate indicated in the table.



Opening pressure test:

Connect up accumulator overflow valve (1) in conjunction with long nut KDEP 1764 (2) to fuel inlet of pump test bench. Suspend accumulator overflow valve in graduate. Increase inlet pressure until valve is heard to open. Reduce inlet pressure to 0.7 bar and increase it again until accumulator overflow valve opens. Compare opening pressure to set value in table.

Opening pressure must be within stated tolerance.



Test specifications – leak test:

Designation Accumulator overflow valve	Test pressure (bar)	Leak rate (cm3/min)
2 417 413 050	0.7	< 100
2 417 413 057	0.7	< 100
2 417 413 064	0.7	< 100
2 417 413 065	1.0	< 100
2 417 413 066	1.0	< 100
2 417 413 069	1.0	< 100
2 417 413 071	1.0	< 100
2 417 413 072	0.7	< 100

Test specifications – opening pressure:

Designation Accumulator overflow valve	Opening pressure (bar)
2 417 413 050	1.3 ... 1.8
2 417 413 057	1.3 ... 1.8
2 417 413 064	1.3 ... 1.8
2 417 413 065	2.0 ... 2.5
2 417 413 066	3.0 ... 3.5
2 417 413 069	2.0 ... 2.5
2 417 413 071	2.7 ... 3.0
2 417 413 072	1.3 ... 1.8

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DIESEL FUEL-INJECTION PUMPS
Instructions regarding storage and commissioning

Workshop: EP
06.1991
0279 En

Certain instructions must be complied with for diesel fuel-injection pumps if they are to be stored for a lengthy period or commissioned following a lengthy period.
If these instructions are not heeded, the fuel-injection pump may be destroyed and could result in failure of the entire engine.

The chemical composition of diesel fuel, engine oil and calibrating oil ISO 4113 is such that they are subject to gumming if the fuel-injection pump is not operated for a lengthy period.

This situation results in malfunctioning of the injection-pump assembly.

The differences between the various diesel fuel-injection pumps necessitate the use of a different method of preservation for each type of injection pump.

IN-LINE PUMP WITH GOVERNOR

STORAGE

Ex-works injection-pump assemblies and injection-pump assemblies from KH/ALP can be put directly into storage.

Repaired injection-pump assemblies must be emptied following test-bench adjustment. The pump openings are subsequently to be sealed (e.g. fuel inlet and fuel return).

MAXIMUM STORAGE PERIOD: 1 year

IN-LINE PUMP WITH GOVERNOR

COMMISSIONING

* Storage period less than 1 year: Injection-pump assembly can be supplied/installed in vehicle without special checking.

* Storage period longer than 1 year: Mechanically test adjusting devices of injection-pump assembly for freedom of movement. Clamp assembly in position on test bench and operate at low speed for approximately 10 minutes. Then check control-rod travel and injected fuel quantity in accordance with test-specification sheet.

VA/VE FUEL-INJECTION PUMP

STORAGE

Ex-works VA/VE pumps or VA/VE pumps from KH/ALP can be put directly into storage.

Repaired VA/VE pumps can be filled or emptied as required following test-bench adjustment. Fuel inlet and fuel return are subsequently to be sealed.

MAXIMUM STORAGE PERIOD

EMPTY : 1 year
FULL : 2 years

VA/VE FUEL-INJECTION PUMP

COMMISSIONING OF EMPTY UNITS

* Storage period shorter than 1 year: VA/VE pump can be supplied/installed in vehicle without special testing.

* Storage period longer than 1 year: Mechanically test adjusting devices of VA/VE pump for freedom of movement. Clamp assembly in position on test bench and operate at low speed for approximately 10 minutes. Then check timing-device travel, pressure and injected fuel quantity in accordance with test-specification sheet.

VA/VE FUEL-INJECTION PUMP

COMMISSIONING OF FILLED UNITS

* Storage period less than 2 years:
VA/VE pump can be supplied/installed in vehicle without special testing.

* Storage period longer than 2 years:
Mechanically test adjusting devices of VA/VE pump for freedom of movement. Clamp assembly in position on test bench and operate at low speed for approximately 10 minutes. Then check timing-device travel, pressure and injected fuel quantity in accordance with test-specification sheet.

MISCELLANEOUS FUEL-INJECTION PUMPS

STORAGE

Ex-works injection pumps or injection pumps from KH/ALP can be put directly into storage.

Repaired pumps must be emptied after test-bench adjustment. Pump openings (e.g. fuel inlet and fuel return) are subsequently to be sealed.

MAXIMUM STORAGE PERIOD: 1 year.

MISCELLANEOUS INJECTION PUMPS

COMMISSIONING

* Storage period less than 1 year:
Fuel-injection pump can be supplied/installed in vehicle without special testing.

* Storage period longer than 1 year:
Mechanically test adjusting devices of fuel-injection pump for freedom of movement. Clamp assembly in position on test bench and operate at low speed for approximately 10 minutes. Then check control-rod travel and injected fuel quantity in accordance with test-specification sheet.

GENERAL

In-line pumps must be filled with the prescribed amount of lubricating oil in the camshaft chamber prior to testing freedom of movement on test bench. In-line injection pumps are then to be connected up to the fuel circuit as is also the case for VA/VE fuel-injection pumps.

The information on storage periods in this Service Info is referenced to the date of manufacture or the date of the last test.

GENERAL

If the procedure indicated in the item

" * Storage period longer than ... year(s)"

is implemented, the injection-pump assembly is re-preserved for the time period indicated under "maximum storage period".

Injection-pump assemblies are to be marked with the date of storage on being put into storage and should be constantly checked.

GENERAL

* Storage temperature -30...+60 ° C.
* Protect injection-pump assemblies against sunlight and moisture.
* The protective caps, protection sleeves or sealing caps fitted by the supplier should not be removed in the case of new injection-pump assemblies/should be used for storage purposes in the case of repaired injection-pump assemblies.

* Testing as a result of the maximum storage period having been exceeded does not represent a warranty situation, i.e. Bosch does not assume the costs thereof.

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FUEL-INJECTION SYSTEMS/
BRAKE SYSTEMS

Health hazards
caused by viton

Motor vehicle:
PKW,NKW,FZD,KFZ
Workshop: EP,NB
08.1991
0281 En

A fire involving viton vulcanizates (e.g. O-rings) leaves residues behind which contain hydrogen fluoride.

Hydrogen fluoride is a toxic, highly caustic compound. If hydrogen fluoride gets onto the skin or into the mucous membranes, it can cause painful wounds which do not heal easily.

We recommend the following measures for workshop personnel whose work involves dealing with burnt-out passenger vehicles/commercial vehicles for assessing injection systems or burnt sealing elements:

* Gloves made of neoprene or PVC should be worn by anyone who could come into contact with viton residues after a fire.

* Should viton residues from a fire come into contact with the skin, rinse the areas immediately with copious amounts of water and go straight to a doctor.

Note:
Viton residues from a fire can be neutralized by washing with calcium-hydroxide solution (slaked lime in water).

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RQ GOVERNOR IN EP COMBINATIONS FOR DAF

Workshop: EP
08.1991
0282 En

Precise governor-spring installation

You may sometimes encounter difficulties when setting governors in EP combinations for DAF engines. These difficulties - in particular when setting the torque control - can be avoided only through precise installation of the governor springs in the flyweights.

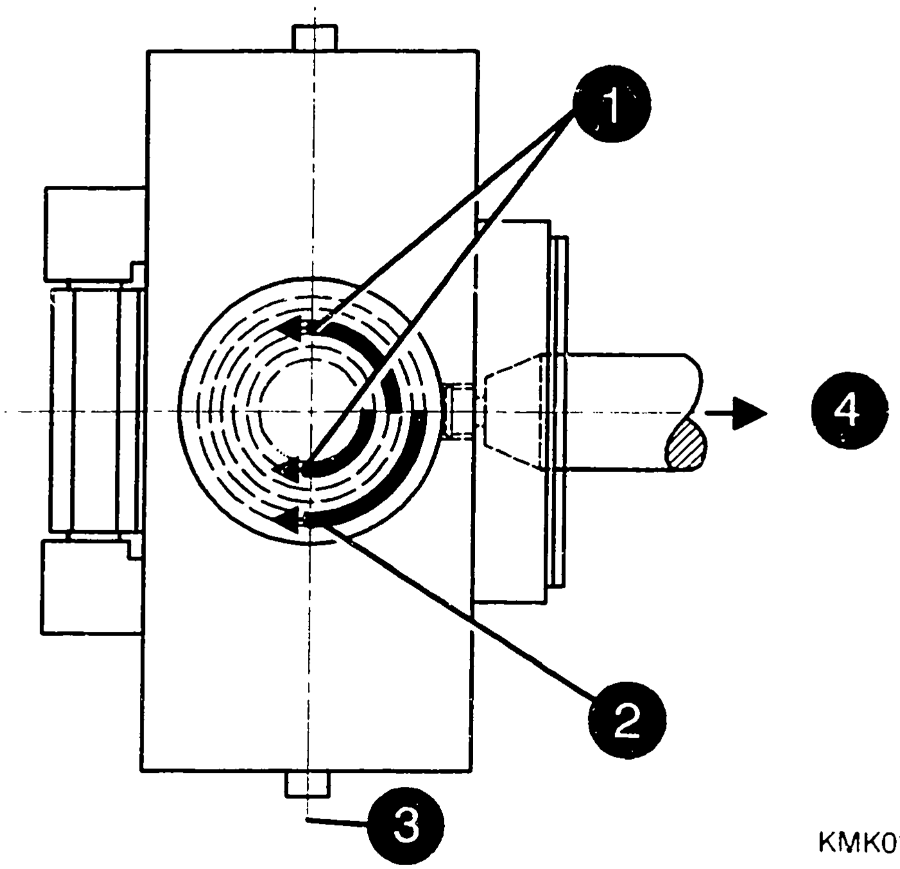
The following governors are affected:

RQ 300/1300 AB 1204R in 0 400 846 537
RQ 300/1300 AB 1204R in 0 400 846 538
RQ 300/1300 AB 1205R in 0 400 846 539
RQ 300/1300 AB 1249R in 0 400 846 581
RQ 300/1300 AB 1253-2R in 0 400 846 582
RQ 300/1300 AB 1253R in 0 400 846 583
RQ 300/1300 AB 1253-1R in 0 400 846 585
RQ 300/1300 AB 1254R in 0 400 846 586

When inserting the governor springs into the flyweights, always make absolutely certain that the ends of the springs are located so that they are positioned precisely on the hinge axis of the flyweight (see illustration).

Each wire end must point away from the fuel-injection pump.

1 = Spring end on bottom spring seat
2 = Spring end on flyweight base
3 = Hinge axis
4 = Pump end



KMK01318

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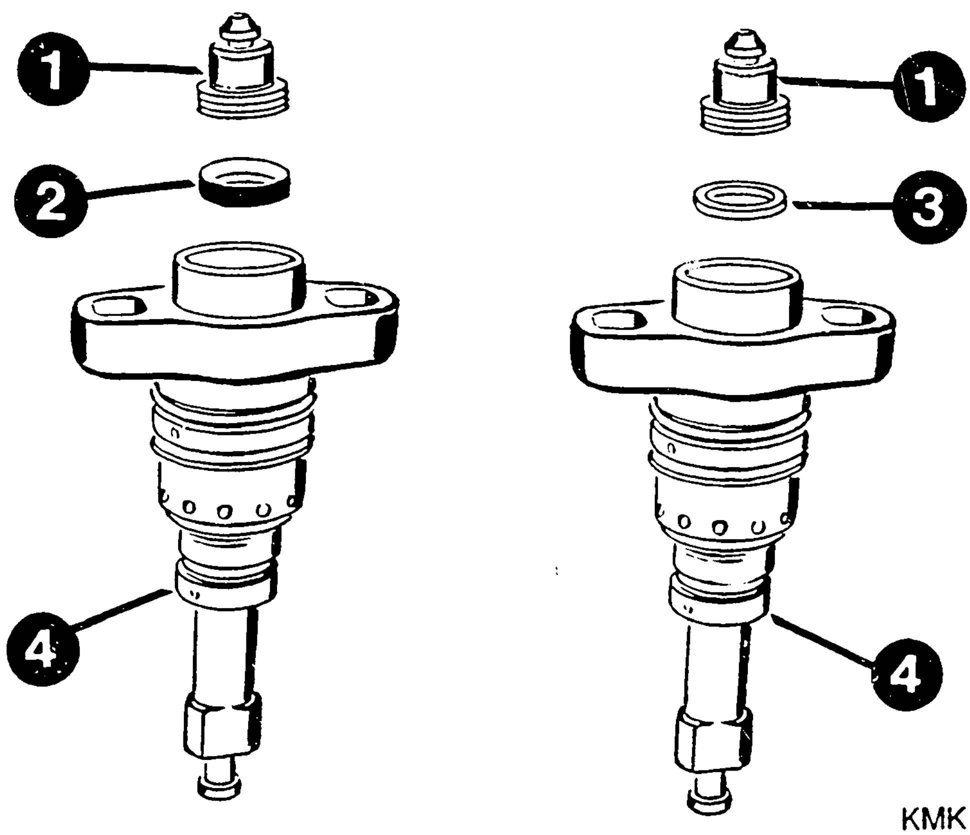
Workshop: EP
08.1991
0283 En

Sealing cap for constant-pressure valve

When carrying out pump repairs, a check must be made as to whether there is a sealing cap (2) or a gasket (3) between delivery-valve assembly (1) and plunger-and-barrel assembly (4).



KMK 01319

Sealing caps are additionally contained in the parts set 2 417 010 010 as of date of manufacture 166.

If sealing caps are installed in the pump, these are not to be replaced by gaskets. In the same manner, gaskets are not to be replaced with sealing caps.

The joint installation of sealing caps and gaskets is not permitted.

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ADDITIONAL TEST SPECS. FOR CALIBRATING NOZZLE-HOLDER ASSEMBLY COMB. 1 688 901 015...019

Workshop: EP
08.1991
0284 En

Test specifications for injection pump combinations are being increasingly compiled for calibrating nozzle-holder assembly combinations 1 688 901 101...110. These correspond to the new type VII and are n o t to be replaced by the calibrating nozzle-holder assembly combinations used to date.

In order to avoid service bottlenecks, additional test specifications are to be compiled for the calibrating nozzle-holder assembly combinations 1 688 901 015...019 (Type III) for a transition period of approximately 2 years for certain injection-pump combinations. These additional test specifications will be marked "T 3" in the "KD IDENT NO" column in the table of contents for the test-specification microcards (WP-00). This stipulation is however only to apply to injection-pump combinations for which the development department responsible makes the data available. Otherwise, test specifications for Type III can not be additionally determined and made available.

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SERVICE PROCEDURE FOR UNIT-PUMP COMBINATIONS

Workshop: EP
08.1991
0286 En

Testing and repair of fuel-injection pumps with non-Bosch governors.

Unit pumps are adjusted in the same way as other fuel-injection pumps. There is however no provision for adjusting the full-load quantity. Adjustment is restricted to the basic setting (uniform delivery) and assignment of the quantity to the control-rod travel.

The test specifications are given in the WP microcards.
Repairs are carried out in the same manner as for other fuel-inject. pumps.
Service parts are listed in the EP microcards.
Use is made of the familiar Bosch service tools.

Warranty:

If complaints are received concerning Bosch fuel-injection pumps with non-Bosch governors, the Bosch warranty covers workmanlike design of the fuel-injection pumps and the corresponding materials.

The following are not covered by the warranty:

- Adjustment errors

- System faults/malfunctions in the unit as a whole

- Interface faults

The interface is the point at which the control rod of the fuel-injection pump is connected to the non-Bosch governor.

Interface faults on fuel-injection pumps with non-Bosch governors are present if:

- Bending moments act on the control rod, i.e. the induction of fuel by the non-Bosch governor is offset from the center axis of the control rod.

- Additional connecting pieces at the control rod weigh more than 100 g.

- The control-rod positioning force is in excess of 70 N.

- There is impermissibly large expansion at the base of the groove in the case of slotted control rods.

- The control-rod travel is limited by the end stop of the control rod.

The Bosch warranty period covers 12 months or a maximum of 2400 hours of operation.

Damage caused by natural wear can not be entertained as grounds for warranty even if it occurs during the warranty period (refer to Warranty Handbook VDT-WAA 051/1-06, 5th edition, Item 1.3).

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P PUMPS

Workshop: EP
10.1991
0290 En

Reduction of full-load delivery of Mercedes-Benz OM442 LA engines in Italy

Mercedes-Benz reduces the full-load delivery of the fuel-injection pump in commercial vehicles fitted with the OM442 LA engine in order to reduce the engine temperature.
This after-sales service measure is restricted to Italy and is handled by the Mercedes-Benz after-sales sevice organization.

The fuel-injection pumps affected are as follows:

0 402 648 844
PE 8 P 120 A 320 LS 7816
RQ 300/1050 PA 717-2 and

0 402 648 845
PE 8 P 120 A 320 LS 7816
RQV 300...1050 PA 797-5

The full-load delivery is reduced by Mercedes-Benz itself only in fuel-injection pumps with a lead seal.
Fuel-injection pumps whose delivery has been reduced are marked with the letter "A" after the 10-digit part number.

"0 402 648 844 A"
"0 402 648 845 A".

If the fuel-injection pump is no longer fitted with a lead seal, the pump is converted to version "A" at a Bosch Service workshop.

The test specifications for the "A" versions of both fuel-injection-pump combinations have been published both for calibrating nozzle-holder assembly combination 1 688 901 105 and for 1 688 901 019.

After the full-load delivery has been reduced at the Bosch Service workshop to that of the "A" version, the fuel-injection pump must likewise be marked by the Bosch Service workshop with the letter "A" after the 10-digit part number.

It is possible that version "A" injection pumps may turn up at other Bosch Service workshops outside Italy.

The fuel-injection pumps must then be set to the test specifications for version "A".

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Asbestos-free flat flange gasket

Due to new EC Guidelines*, asbestos-containing flat flange gaskets for EP combinations have been replaced by asbestos-free flat flange gaskets.

* (Guidelines of the European Community)

The following versions of asbestos-free flat flange gaskets are in use:

Designation	:	NOVAPRESS 805
Manufacturer	:	Frenzelit Co.
Color	:	Bright red

Designation	:	SIL – C 6307
Manufacturer	:	Klinger Co.
Color	:	Bright yellow

Specific procedures must be observed when using asbestos-free flat flange gaskets for EP combinations:

* Immerse gasket in calibrating oil for approx. 5 seconds.

* Leave gasket to swell for approx. 30 seconds.
  Install gasket i m m e d i a t e l y.

Notes:

* Always use a new gasket after disassembling/assembling components that are sealed from the outside, inside or other components by means of swelling, asbestos-free, flat flange gaskets.

* Do not assemble asbestos-free flat flange gaskets when they are dry.

* Do not leave gaskets to swell for longer than the specified period.

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VE INJECTION PUMP

Workshop: EP
10.1991
0293 En

LASER MARKING OF
VE TYPE DESIGNATION

The gradual introduction of laser marking for VE pumps (labelling previously rolled in) may result in incorrect reading of the rating plate if engine and pump are painted by engine manufacturer.

In order to guarantee proper pump identification in such cases, the paint coat is only to be removed with commercially available paint solvent.

I M P O R T A N T

The labelling becomes illegible if paint or residual paint is removed by scraping it off for example.

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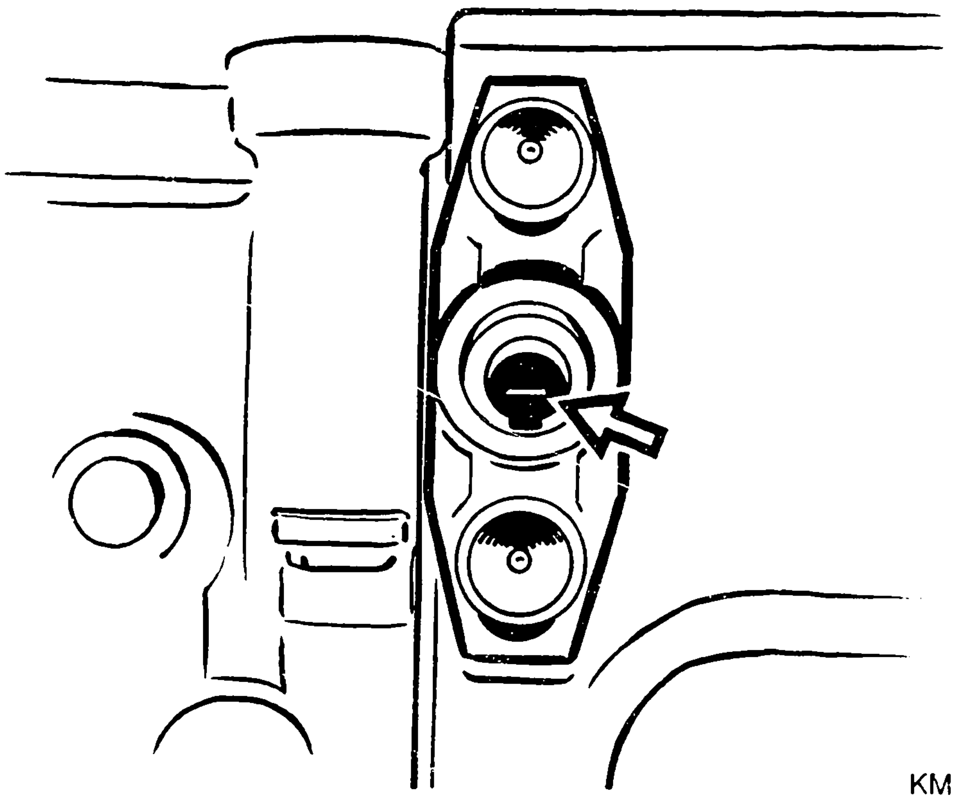
IN-LINE PUMP

Workshop: EP
10.1991
0294 En

START-OF-DELIVERY ADJUSTMENT
ON INJECTION-PUMP TEST BENCH
WITH LIGHT-SIGNAL GENERATOR
KDEP 1600/1601

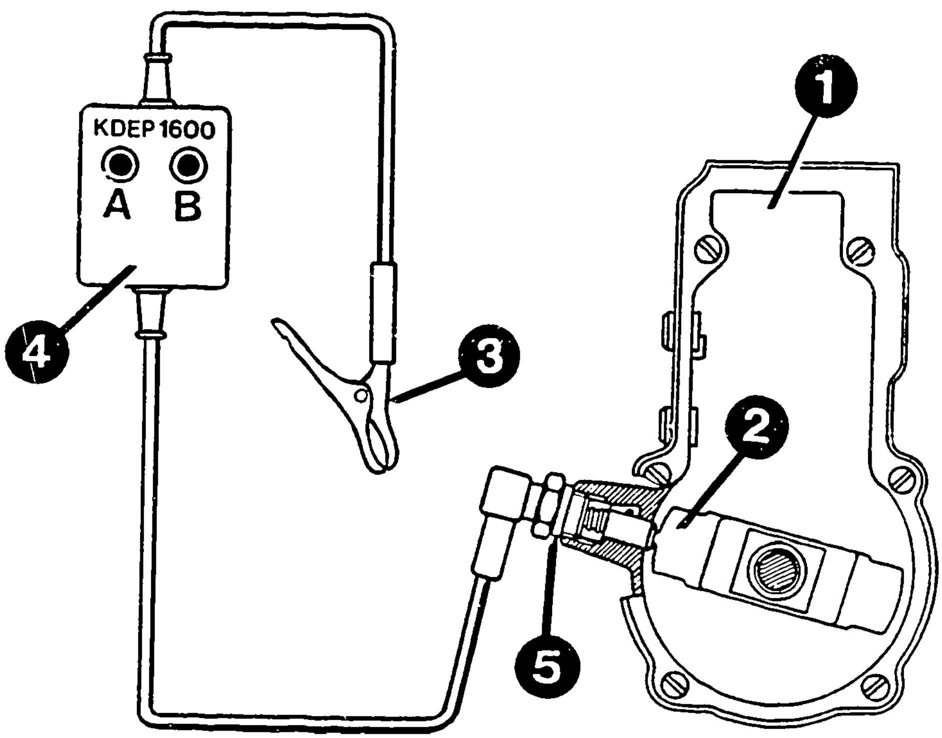
Prerequisite:
Set prestroke to mean value as per test-specification sheet.
Align adjustment flange in mid-position of signal mark on governor assembly (arrow).



KMK 01526

KDEP 1600 TERMINAL DIAGRAM

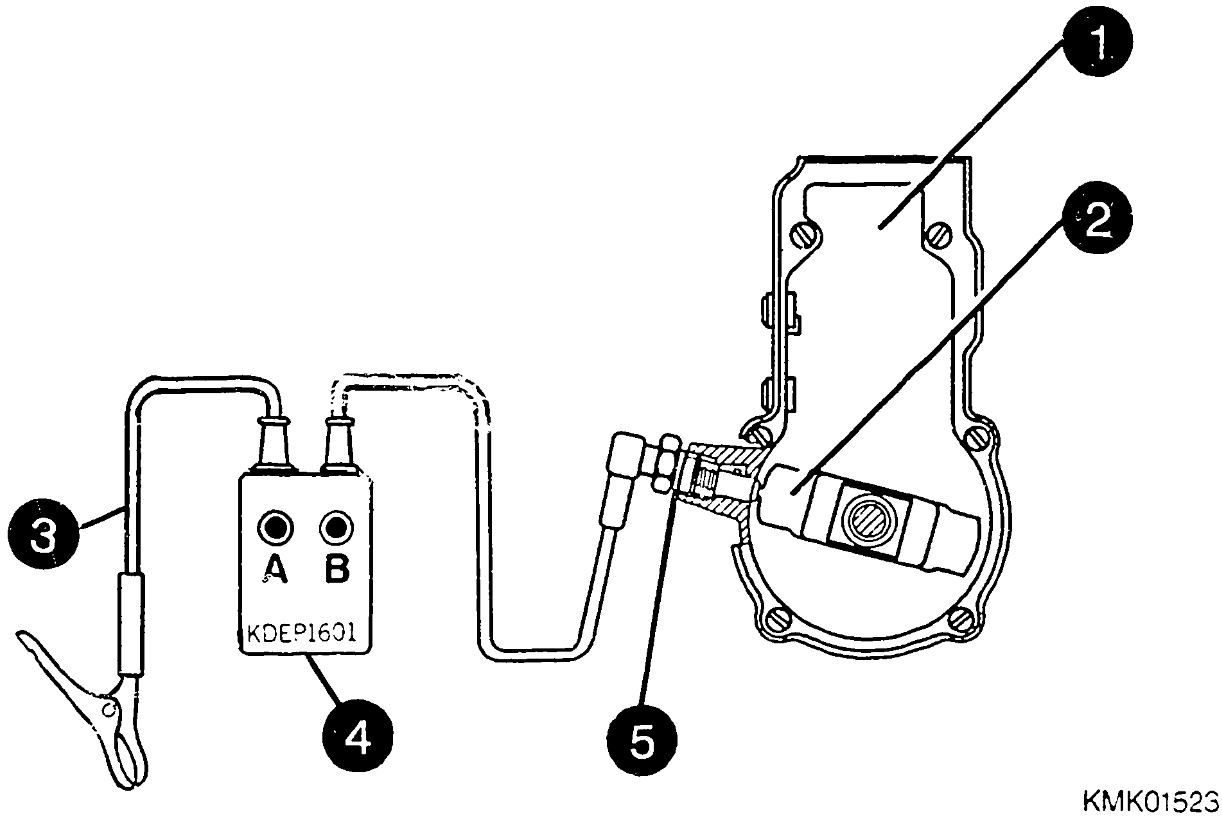
1 = Fuel-injection pump
2 = Flyweight with signal mark
3 = Terminal for battery + (red)
4 = Light-signal generator KDEP 1600
5 = Signal generator



KMK 01522

KDEP 1601 TERMINAL DIAGRAM

1 = Fuel-injection pump
2 = Flyweight with signal mark
3 = Ground connection cable (black)
4 = Hand housing KDEP 1601
5 = Signal generator



Insert light-signal generator into
adjustment flange.
Slightly tighten knurled screw.

CONNECT UP LIGHT-SIGNAL GENERATOR
KDEP 1600 AS FOLLOWS:
Connect red terminal to terminal 30,
battery + or charger.

CONNECT UP LIGHT-SIGNAL GENERATOR
KDEP 1601 AS FOLLOWS:

Connect ground lead with terminal
(black) to pump housing.

Clean generator prods with compressed
air if both diodes light when screwing
generator into governor housing.

I M P O R T A N T :
Never connect up ground lead to
battery or charger.
KDEP 1601 is supplied with power by
way of 9 V battery.

1 = Direction of pump rotation
2 = Adjustment-flange attachment viewed towards drive
3 = Adjustment-flange direction

1	2	3
right	right	from bottom to top
left	right	from bottom to top
right	left	from top to bottom
left	right	from top to bottom

Slowly move adjustment flange in line with direction of rotation of pump until second LED lights.
Hold camshaft in this position.
Remove light-signal generator.
Tighten adjustment flange.

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VE INJECTION PUMP

Workshop: EP
10.1991
0296 En

ADJUSTMENT OF MICROSWITCH FOR EXHAUST-GAS RECIRCULATION AND GLOW PLUG SYSTEM

Use of microswitch:

* Load switch for EGR
* Deactivation of after-glow system

The following adjustment procedure applies only to VE pumps W I T H potentiometer and 3rd part-load-delivery stop

Prerequisites:
* Pump fully adjusted
* Fit stop plate
* Attach microswitch

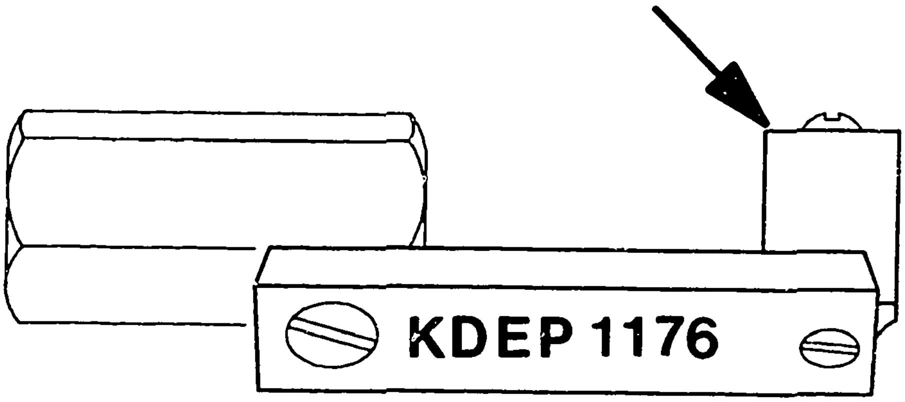
Arrow = Spacer piece 11.8 mm

ADJUSTMENT INSTRUCTIONS:

Remove spacer piece required from range spacer KDEP 1176.

Press speed control lever with auxiliary spring against spacer piece.

Use feeler gauge to compensate for difference with respect to stated dimensions in each case.



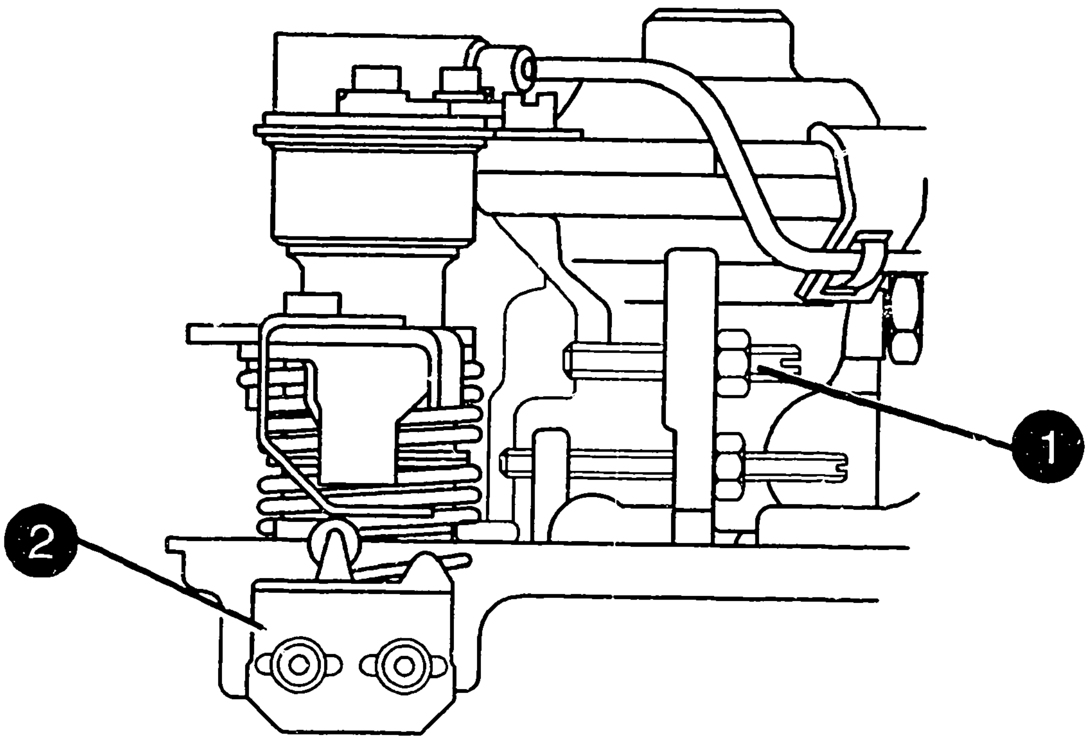
KMK01530

1 = 3rd part-load-delivery stop
2 = Microswitch

MICROSWITCH ADJUSTMENT

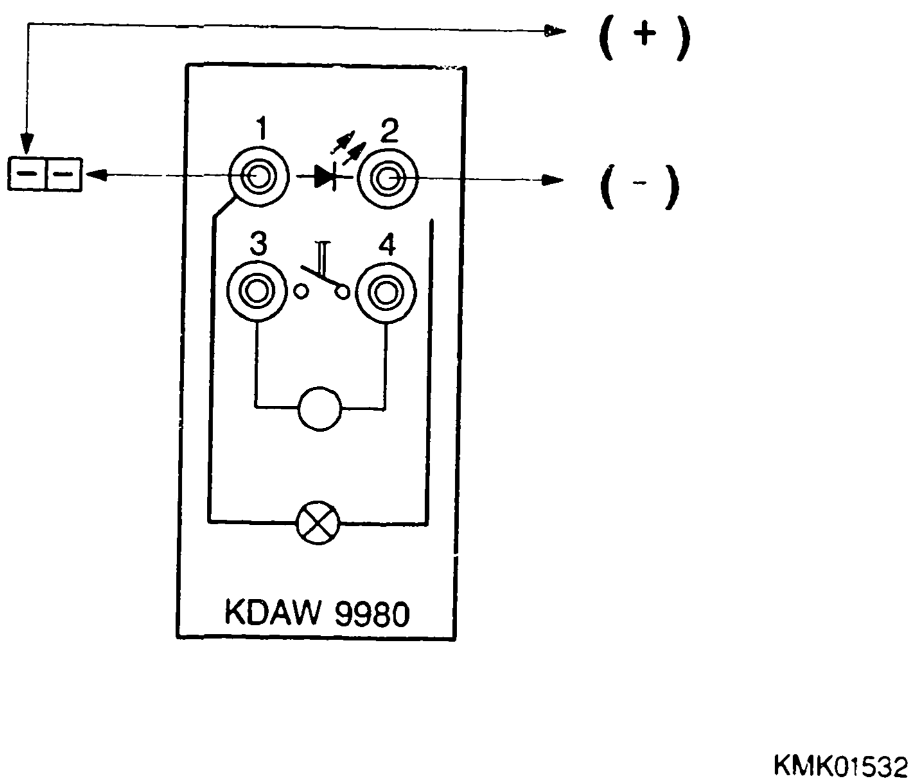
Press speed control lever with spacer piece 12 mm against 3rd part-load-delivery stop.

Approach speed for part-load delivery and set delivery.



Use KDAW 9980 for adjusting switching point.
Connect up KDAW 9980 as follows:
Connect socket 2 of KDAW to negative connection of stabilizer.
Connect socket 1 of KDAW to plug contact of pump.
Apply 12 volt supply voltage to plug contact.

SWITCHING-POINT ADJUSTMENT
Move microswitch until LED goes out.
Fix microswitch in this position with fastening screws.

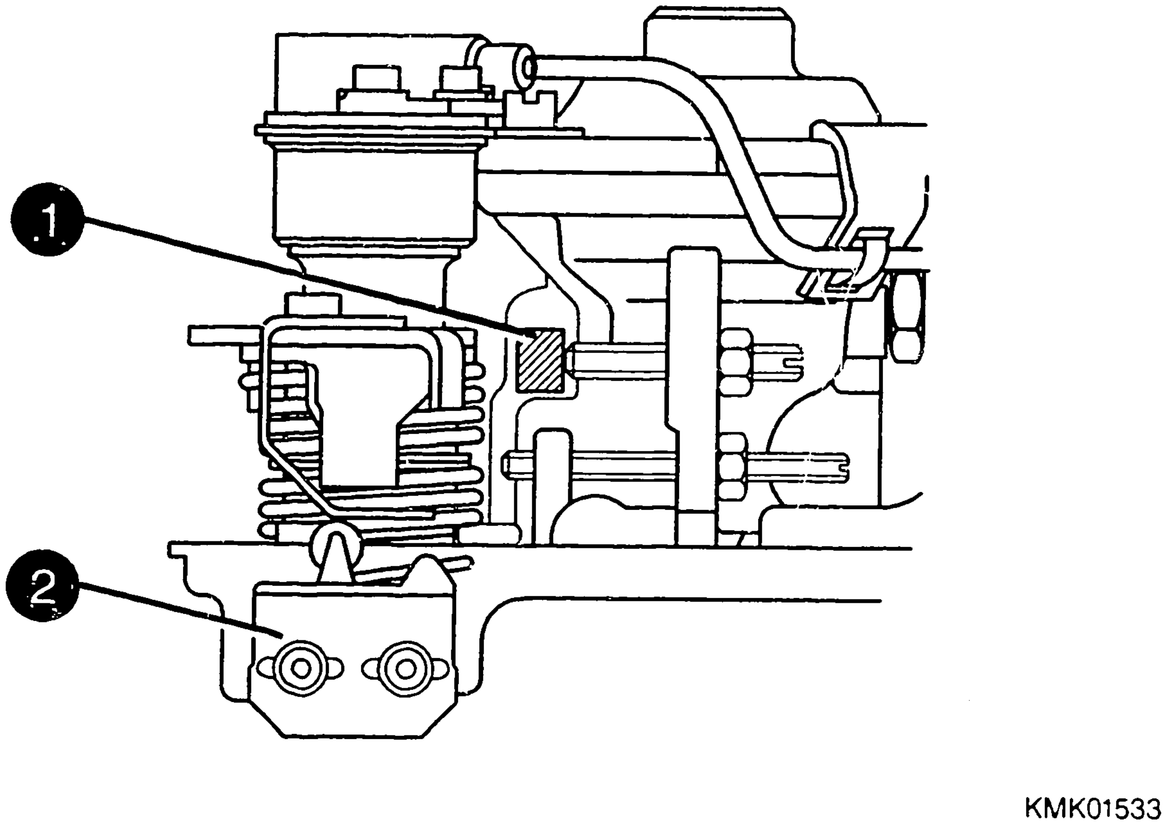


1 = Spacer piece
2 = Microswitch

CHECKING SWITCHING-POINT ADJUSTMENT

Press speed control lever with spacer piece 12.2 mm against 3rd part-load-delivery stop.
Connect up KDAW 9980.
The microswitch must not switch in this lever position.
LED on.

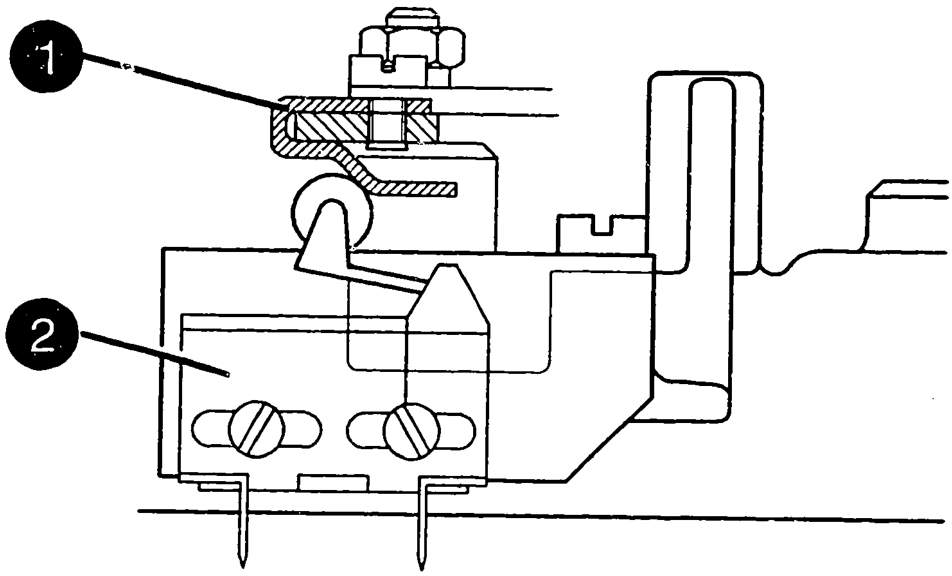
Add spacer piece 11.8 mm.
LED off.
Adjust microswitch if switching points are not attained.



1 = Stop plate
2 = Microswitch

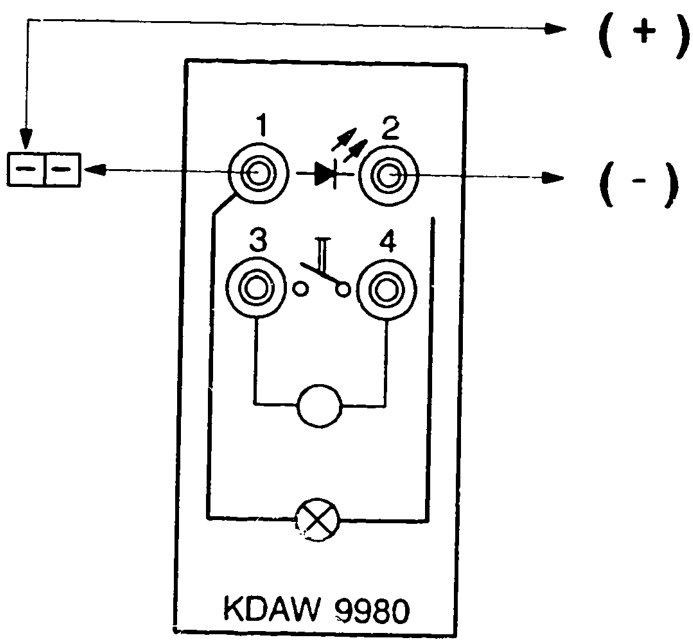
MICROSWITCH ADJUSTMENT
The following adjustment procedure applies only to VE pumps W I T H no potentiometer and 3rd part-load-delivery stop.

Prerequisites:
* Pump fully adjusted.
* Fit stop plate.
* Attach microswitch.
* Position speed control lever with spacer piece as per test-specification sheet against residual-quantity adjusting screw/ idle stop.



KMK01534

Use KDAW 9980 to adjust switching point.
Connect up KDAW 9980 as follows to microswitch plug.
Connect socket 2 of KDAW to negative connection of stabilizer.
Connect socket 1 to plug contact or microswitch.
Apply 12 volt supply voltage.
Move microswitch as far as switching point.
Diode lights.



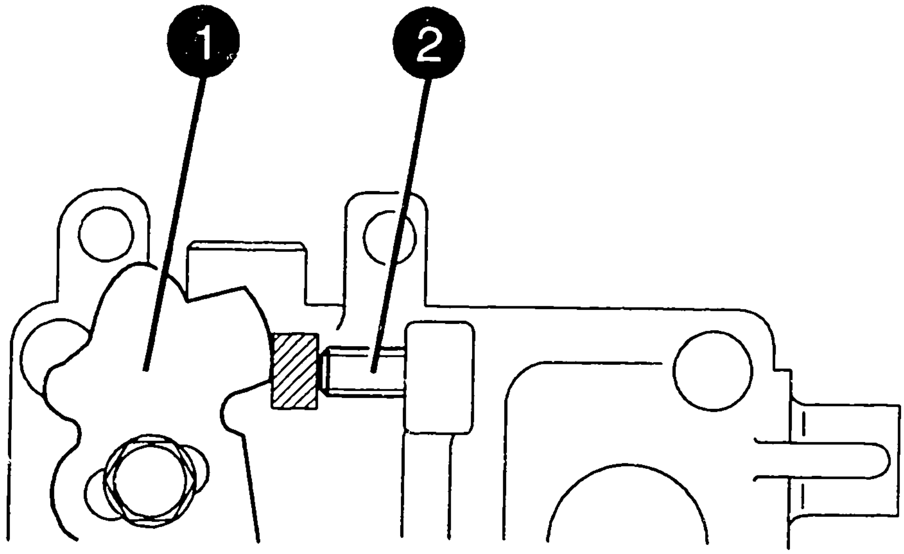
KMK01532

1 = Speed control lever
2 = Residual-quantity stop screw

CHECKING MICROSWITCH ASSIGNMENT

Add spacer piece 12.4 mm between speed control lever and residual-quantity stop screw.
LED off

Add spacer piece 11.6 mm between speed control lever and residual-quantity stop screw.
NOTE:
KDEP 1189 = 10.8 mm
Provide compensation for difference.
LED on

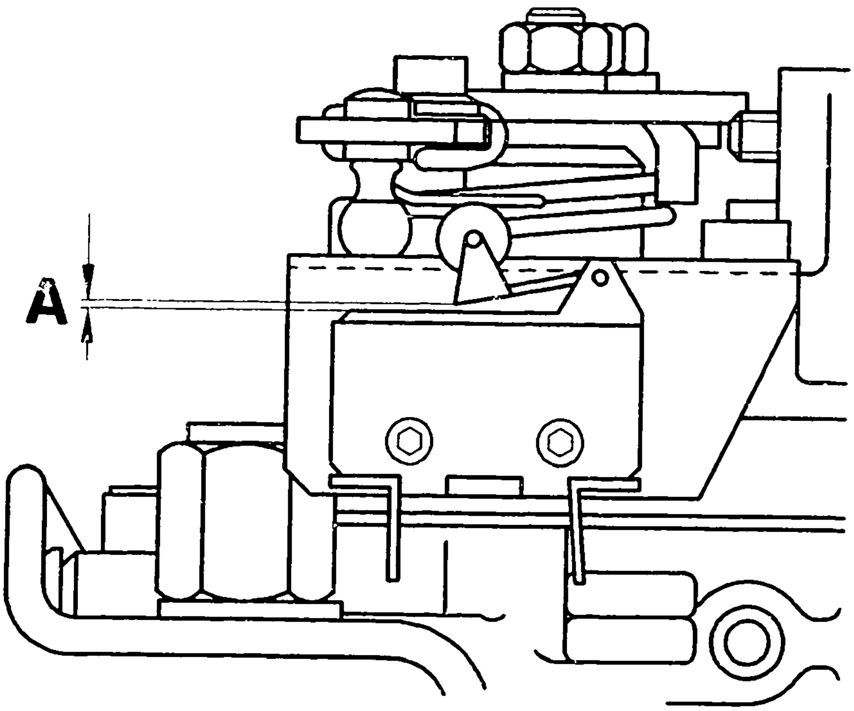


KMK01535

CHECKING RESIDUAL TRAVEL OF MICROSWITCH

Position speed control lever against rated-speed stop.
Measure gap "A".

Refer to Remarks in test-specification sheet for adjustment dimension.



KMK01536

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VE INJECTION PUMP

Workshop: EP
10.1991
0297 En

ADJUSTMENT OF EGR POTENTIOMETER

The potentiometer belongs to the EGR system sensors.
The coupled driver turns in line with the change in the position of the speed control lever.
An integrated wiper contact on a resistor board changes the output voltage depending on the position of the wiper contact.

LEVER POSITIONS FOR VARIOUS POTENTIOMETER VERSIONS

* Fuel-injection pump with 3rd part-load-delivery stop:
  Position speed control lever against idle/residual-quantity stop.

* Fuel-injection pump with 3rd and 4th part-load-delivery stop:
  Position speed control lever with spacer piece against 3rd and 4th stop.

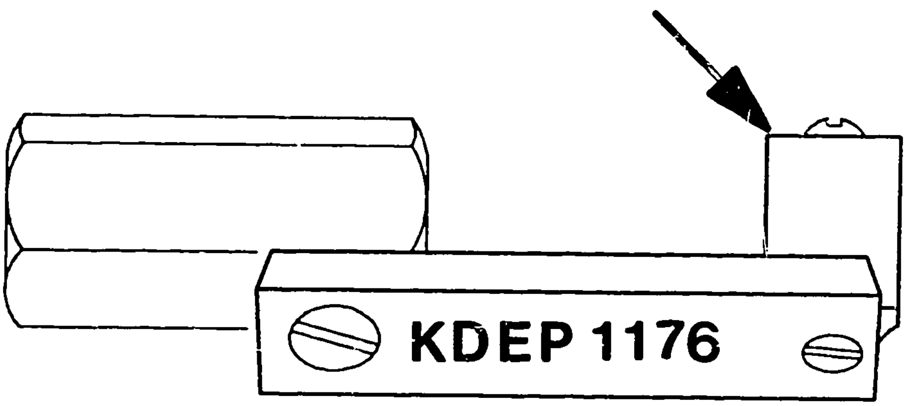
Arrow = Spacer piece 11.8 mm

ADJUSTMENT INSTRUCTIONS:

Remove spacer piece required from range spacer KDEP 1176.

Press speed control lever with auxiliary spring against spacer piece.

Use feeler gauge to compensate for difference with respect to stated dimensions in each case.



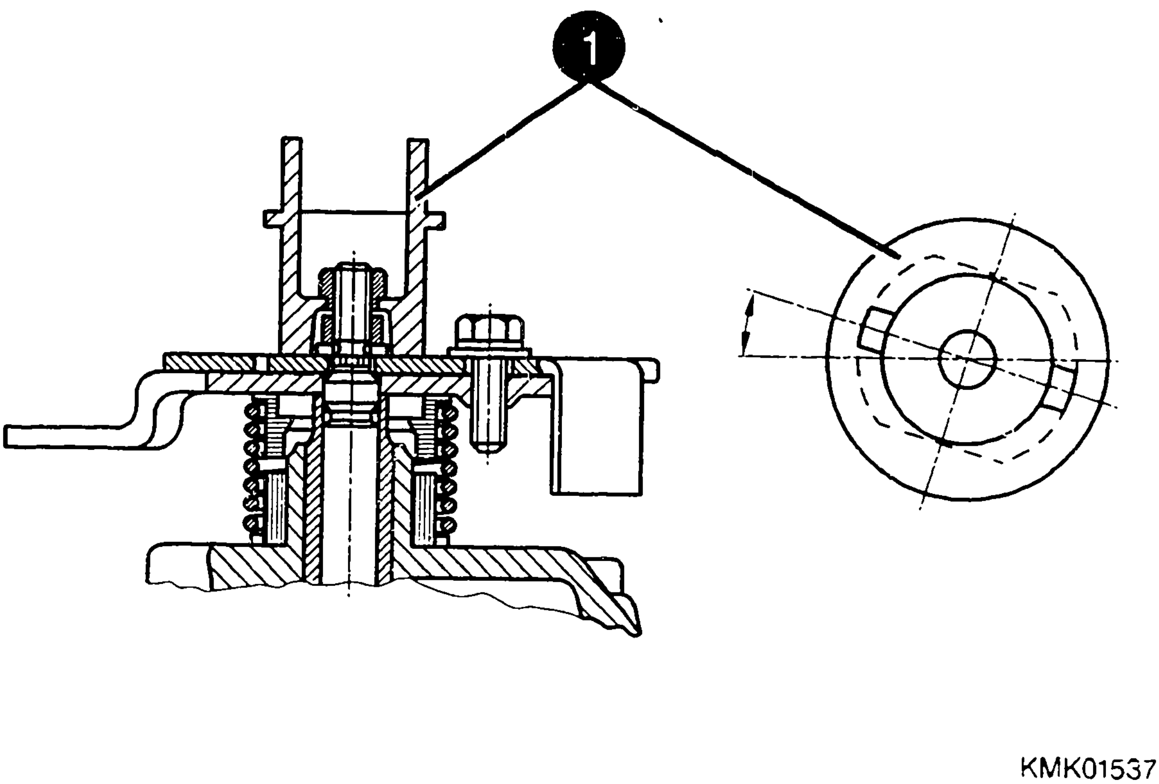
KMK01530

1 = Driver

POTENTIOMETER ADJUSTMENT
* Pump with 3rd part-load-delivery stop

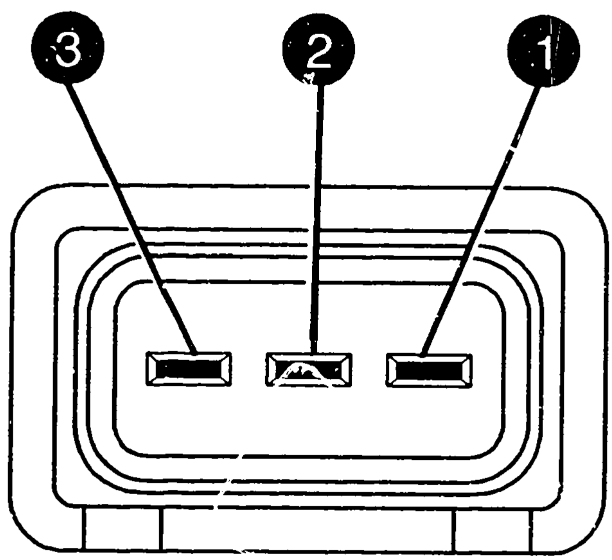
Prerequisite:
Fuel-injection pump fully adjusted.

Mount driver on preassembly bracket (in line with test-specification sheet) whilst speed control lever is in contact with idle/residual-quantity stop.
Tighten driver to prescribed tightening torque.
Fit potentiometer; slightly tighten securing plate.



Contact 1 = Ground
Contact 2 = Tap
Contact 3 = Positive terminal

Apply DC voltage as per test-specification sheet to plug contact 3(+) and plug contact 1 (ground).
Connect up voltmeter to plug contacts 1 and 2.
Set specified voltage (in line with test-specification sheet) by turning potentiometer housing.



KMK01538

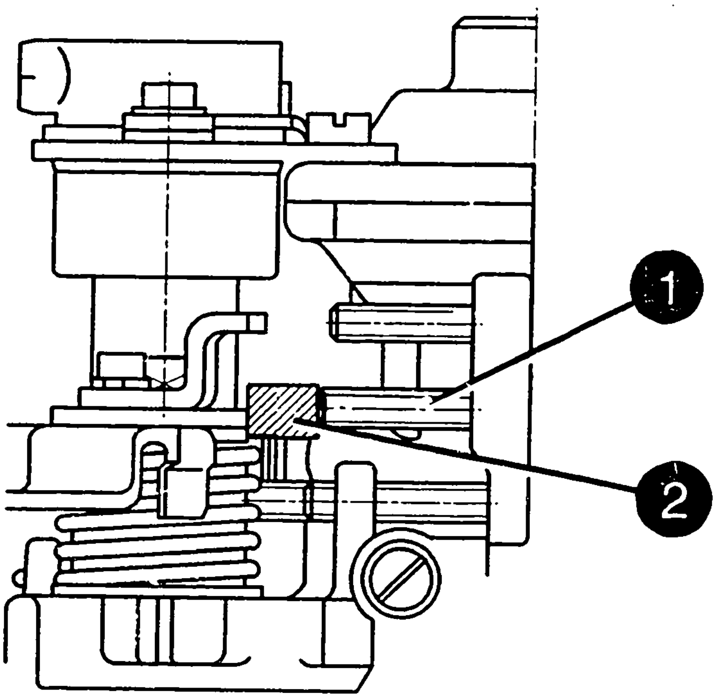
1 = Adjusting screw, 3rd stop
2 = Spacer piece

POTENTIOMETER ADJUSTMENT

* Pump with 3rd and 4th part-load-delivery stop

ADJUSTING PART-LOAD DELIVERY

Insert spacer piece 12.0 mm at 3rd stop between control lever and part-load stop screw.
Position control lever against spacer piece.
Approach speed for part-load delivery at 3rd stop.
Set delivery by way of adjusting screw.

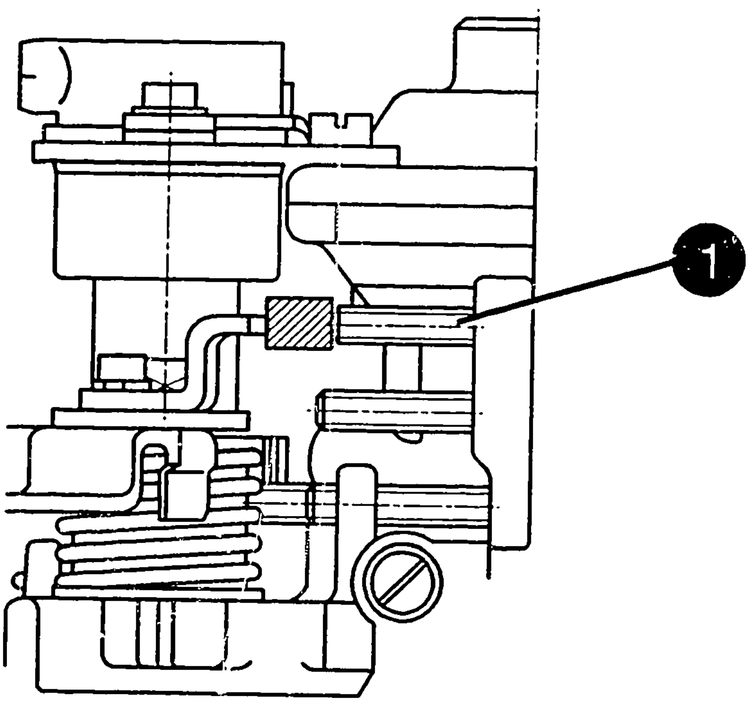


KMK01539

1 = Adjusting screw, 4th stop

Insert spacer piece 12.0 mm at 4th stop between control lever and part-load stop screw.

Position control lever against spacer piece.
Approach speed for part-load delivery at 4th stop.
Set delivery by way of adjusting screw.



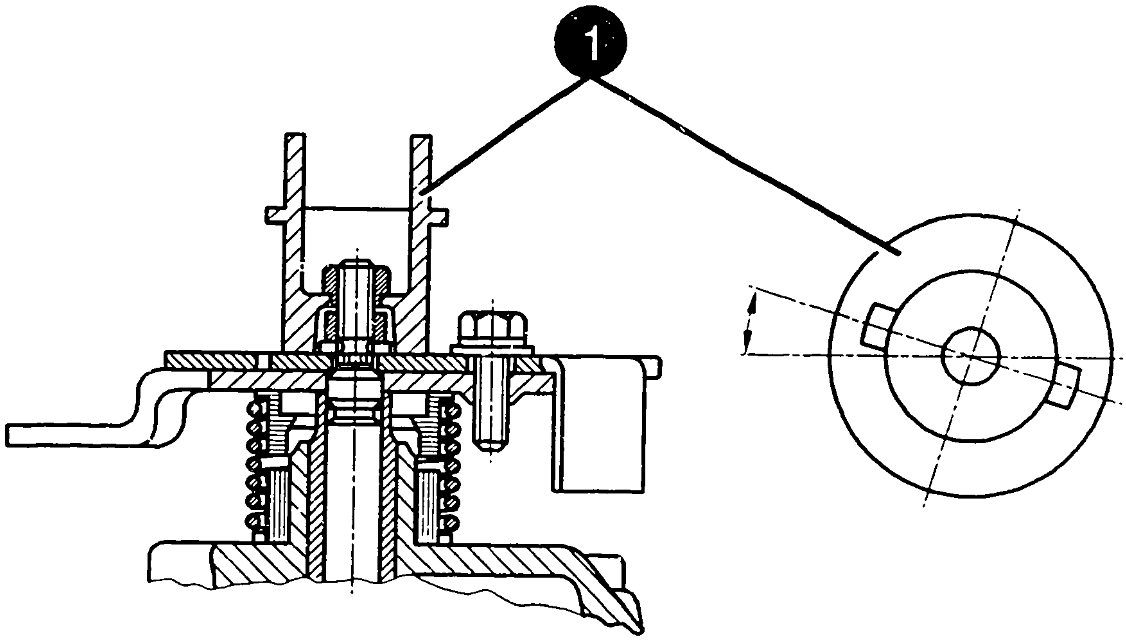
KMK01540

POTENTIOMETER ADJUSTMENT

1 = Driver

Prerequisite:
Pump (including 3rd and 4th stop) set

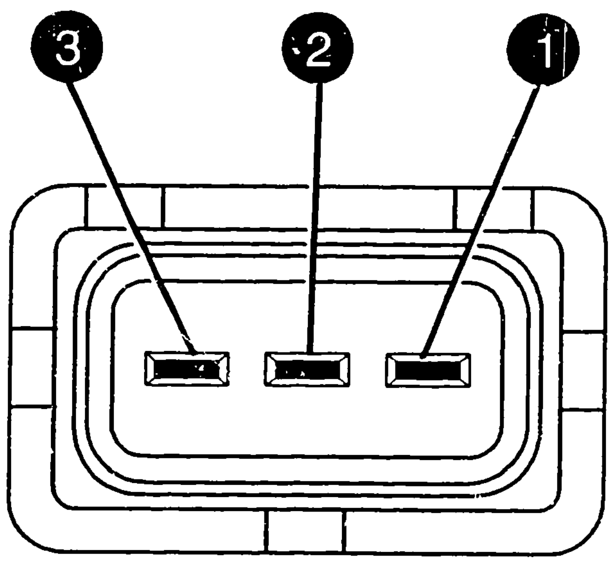
Position driver on setting shaft and align with angle gauge to 25° (refer to Remarks in test-specification sheet for deviation).
Tighten driver to prescribed tightening torque.
Fit potentiometer; slightly tighten securing plate.



KMK01541

Contact 1 = Ground
Contact 2 = Tap
Contact 3 = Positive terminal

Apply DC voltage as per test-specification sheet to plug contact 3(+) and plug contact 1 (ground).
Connect up voltmeter to plug contacts 1 and 2.
Position speed control lever with spacer piece 12 mm against 3rd part-load-delivery stop.
Set specified voltage by turning potentiometer housing.

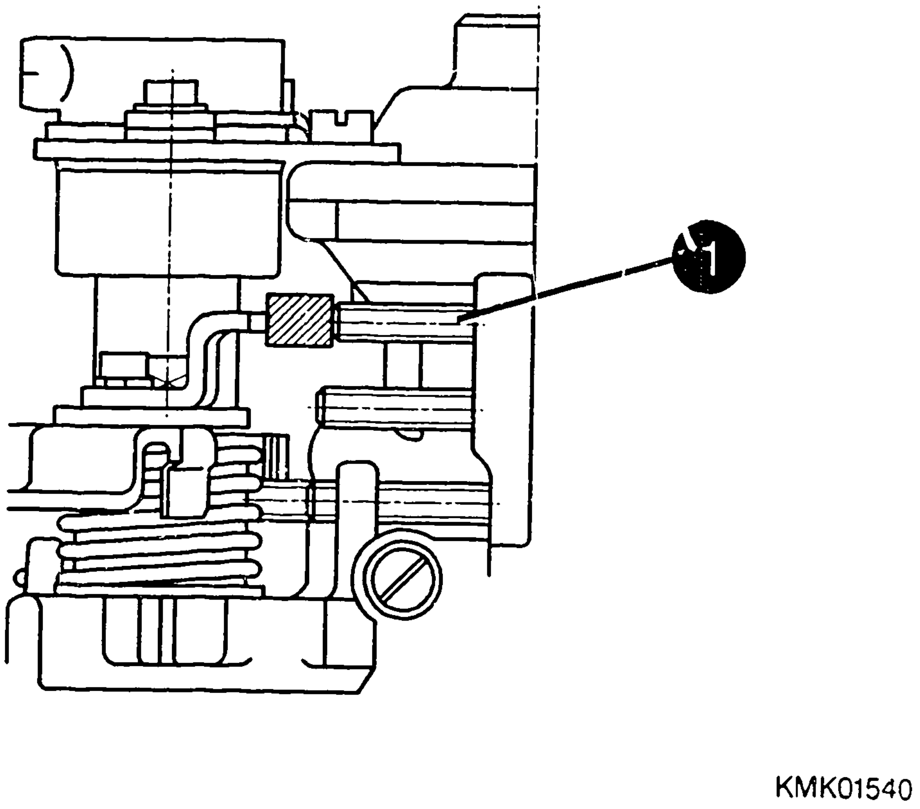


KMK01542

1 = 4th part-load-delivery stop

Tighten securing plate to prescribed tightening torque.
Check adjustment again.

Position speed control lever with spacer piece 12.0 mm against 4th part-load-delivery stop.
Specified voltage must be obtained in this control-lever position.
If specified value is not attained, turn potentiometer within value range.
If specified values are not obtained, install replacement potentiometer (calibrated potentiometer) in accordance with service-parts list.



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IVECO DAILY
2.5 L DI
with VE injection pump
VE 4/11 F 1900 R 393
0 460 414 078

Motor vehicle: NKW
and workshop: EP
10.1991
0298 En

Complaint:
No/delayed throttle take-up from low idle.

The pump is subjected to on-the-engine adjustment by IVECO Sofim, so as to obtain the lowest possible smoke values.
This involves reducing the full-load delivery to such an extent that there is also a decrease in the normal full-load delivery.

Consequence:
The engine does not accelerate or only hesitantly from low idle.

Remedy:
Higher "on-the-engine" normal-delivery setting.

Note:

In view of the fact that IVECO Sofim performs subsequent on-the-engine adjustment of the pump, the situation in this case is n o t one which involves a complaint for which BOSCH is responsible.

Work performed in this connection is likewise n o t to be billed under warranty.

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PE(S)..P..S 7100/7800

Workshop: EP
10.1991
0299 En

New cylindrical-roller
bearing on governor end

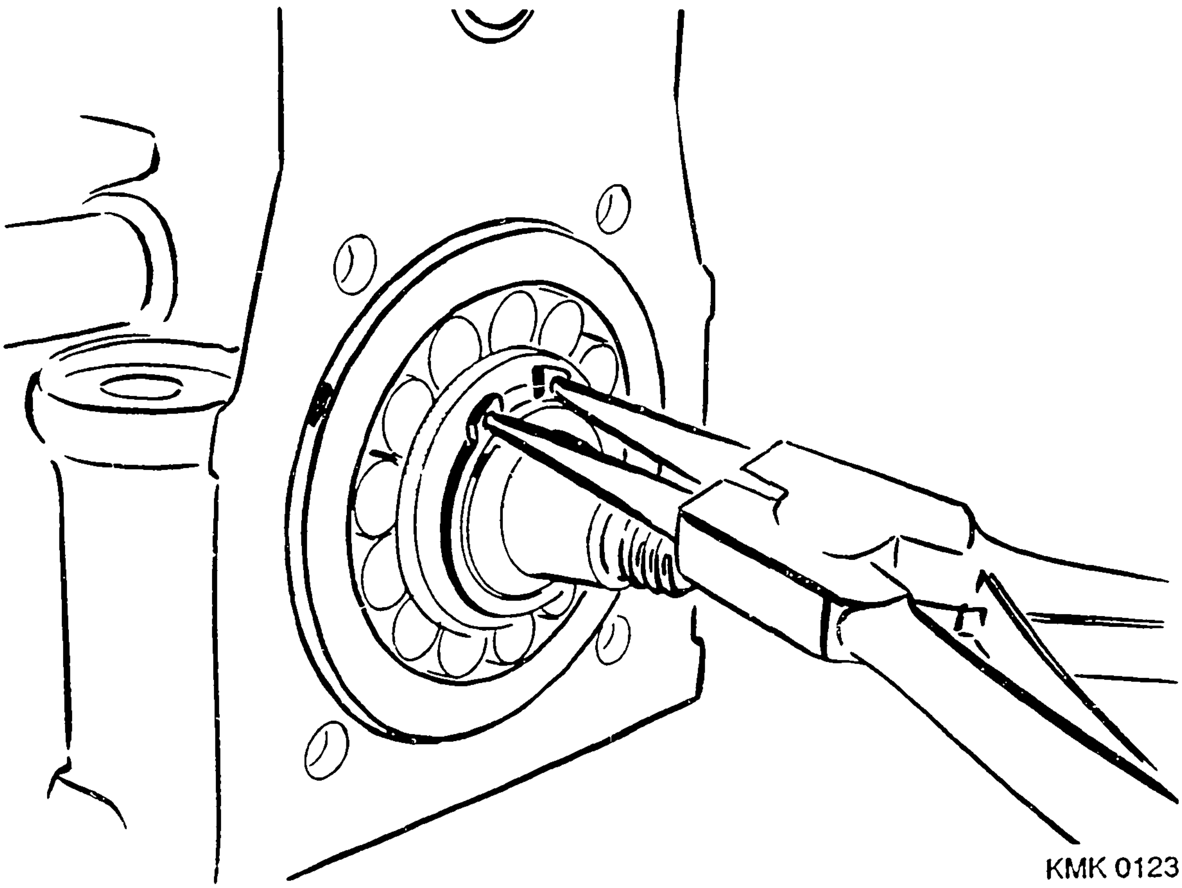
Installation instructions

Use is gradually being made on individual versions of the size "P", series 7100/7800 fuel-injection pumps of a cylindrical-roller bearing instead of the self-aligning roller bearing on the governor end. This bearing is initially being installed on certain injection pumps for MERCEDES-BENZ.

In contrast to the self-aligning roller bearing, the cylindrical-roller bearing has no annular groove on the outer race for extraction purposes.

REMOVAL OF CAMSHAFT – CYLINDRICAL–ROLLER BEARING

Remove circlip of camshaft bearing from camshaft.

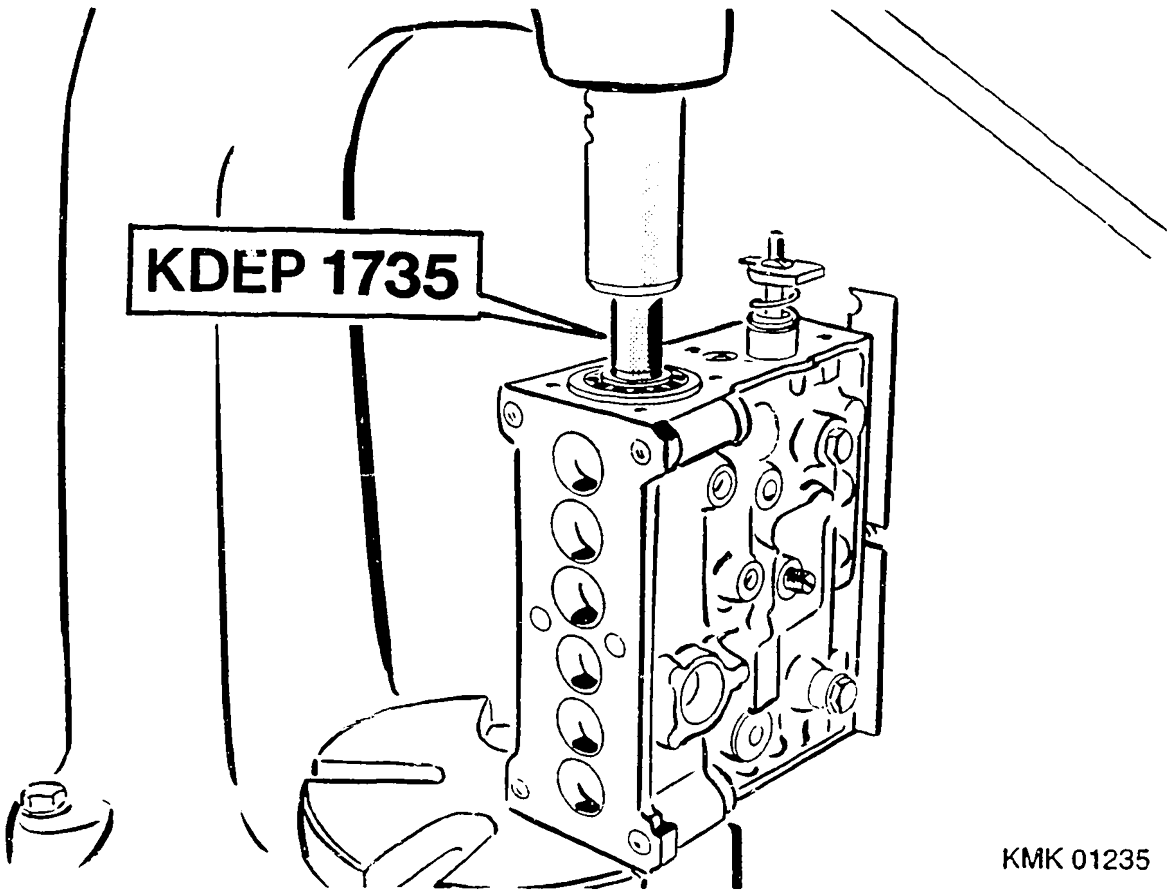

KMK 01231

REMOVAL OF CAMSHAFT – CYLINDRICAL-ROLLER BEARING

Position drive end of pump on screw press.
Attach pressing-out sleeve KDEP 1735 to camshaft on governor end and press out camshaft.

C A R E F U L L Y remove camshaft from pump housing.

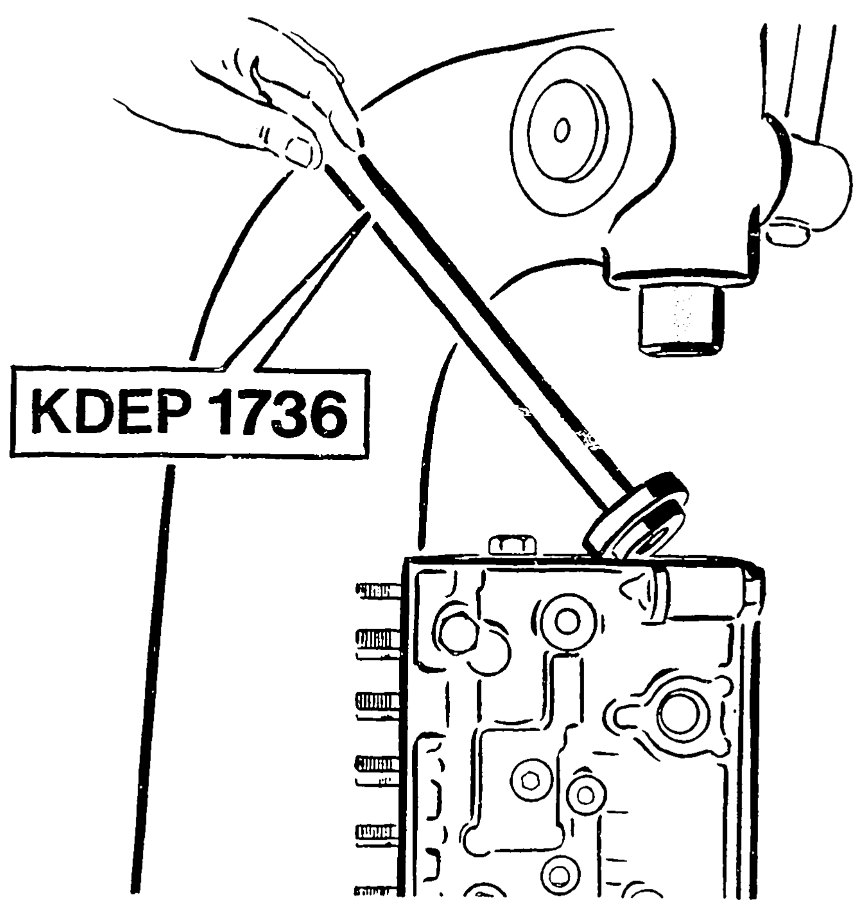
Remove intermediate bearing from camshaft and set it down.



REMOVAL OF CAMSHAFT – CYLINDRICAL-ROLLER BEARING

Turn pump housing round and position it on governor end. Insert pressing-out disc with pipe KDEP 1736 into camshaft chamber and press outer race of roller bearing out of pump housing. (Pay attention to exact position of pressing-out disc !!!)

Note:
The pressing-out procedure described deforms the roller bearing on the governor end. Use is therefore to be made of a N E W roller bearing.



KMK 01236

The procedure to be employed when installing the new bearing on the camshaft is the same as that used when installing the self-aligning roller bearing. The corresponding information in the repair instructions applies accordingly.

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SIGMA FUEL-INJECTION PUMPS ASE.., ASM.., ASV.. HYDRAULIC GOVERNORS H 10, H 15, H 20, H 25

Workshop: EP
10.1991
0301 En

After-sales service

Production of the fuel-injection pumps and hydraulic governors outlined in the heading has been taken over by I.D.L.P. sa from S.E.M.T. PIELSTICK.

I.D.L.P. is not only responsible for production, but also for sales, after-sales service and repair. As of now, service parts are to be procured from the following address:

I.D.L.P. sa
260 Av. Aristide Briand
F - 92220 BAGNEUX

Telephone	:	45.47.52.70
Service cde	:	45.47.04.00
Telex	:	205578 F
Telefax	:	45.36.07.37

Your person to contact is Mr. Bernard VIEUX

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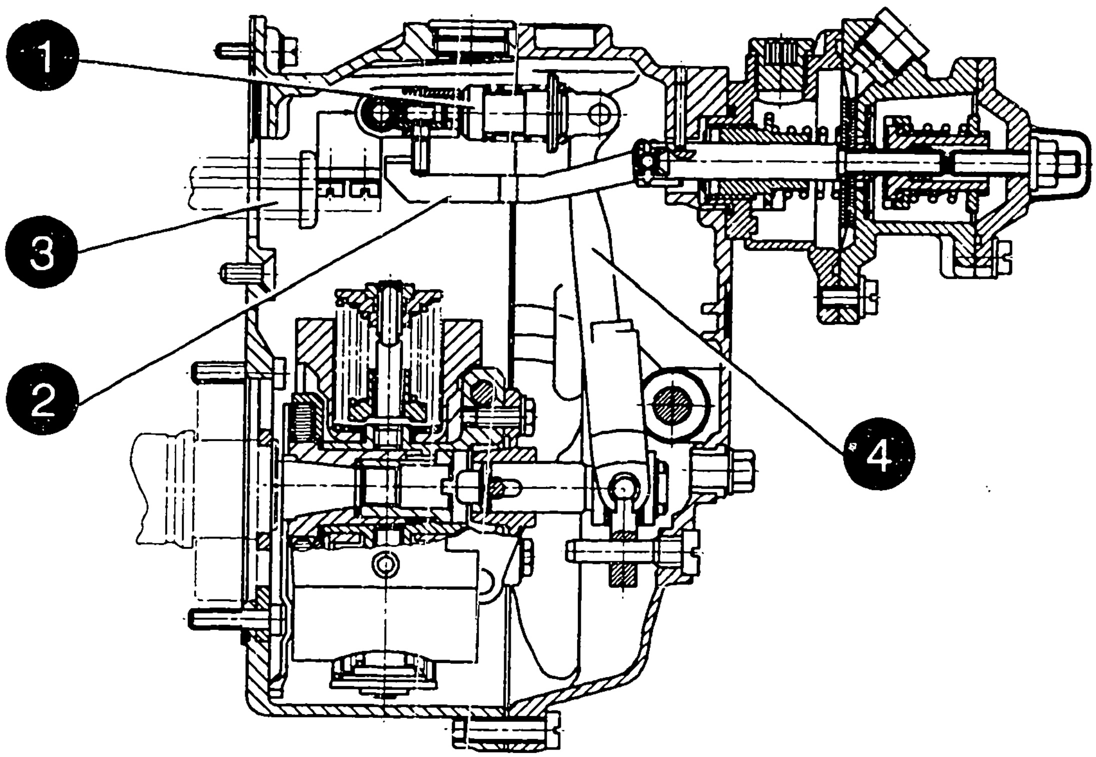
RQ GOVERNOR

Workshop: EP
12.1991
0302 En

Function and testing
of TAS link

1 = TAS link
2 = LDA link
3 = Control rod
4 = Fulcrum lever

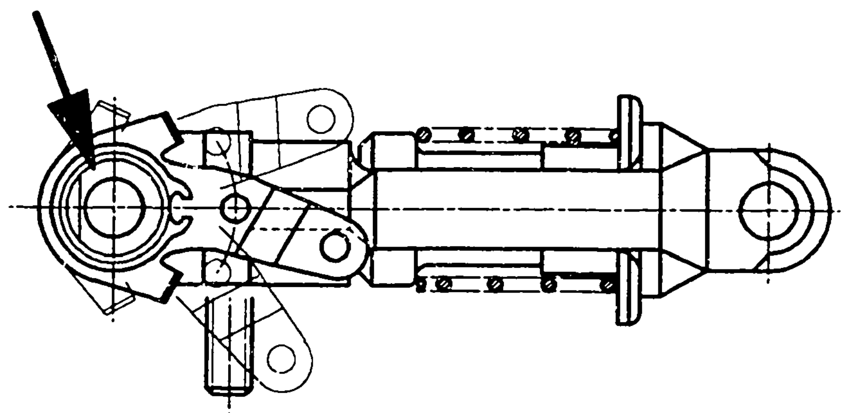


KMK01632

The temperature-dependent starting control-rod-travel regulation (TAS) is designed to prevent the cold-start control position being reached on hot starting and with the accelerator pedal fully depressed.

The cold-start/warm-start quantity is controlled by way of the TAS link which features an integrated expansion element. The operating temperature of the expansion element is approx. +4 ... -8 Grad C.

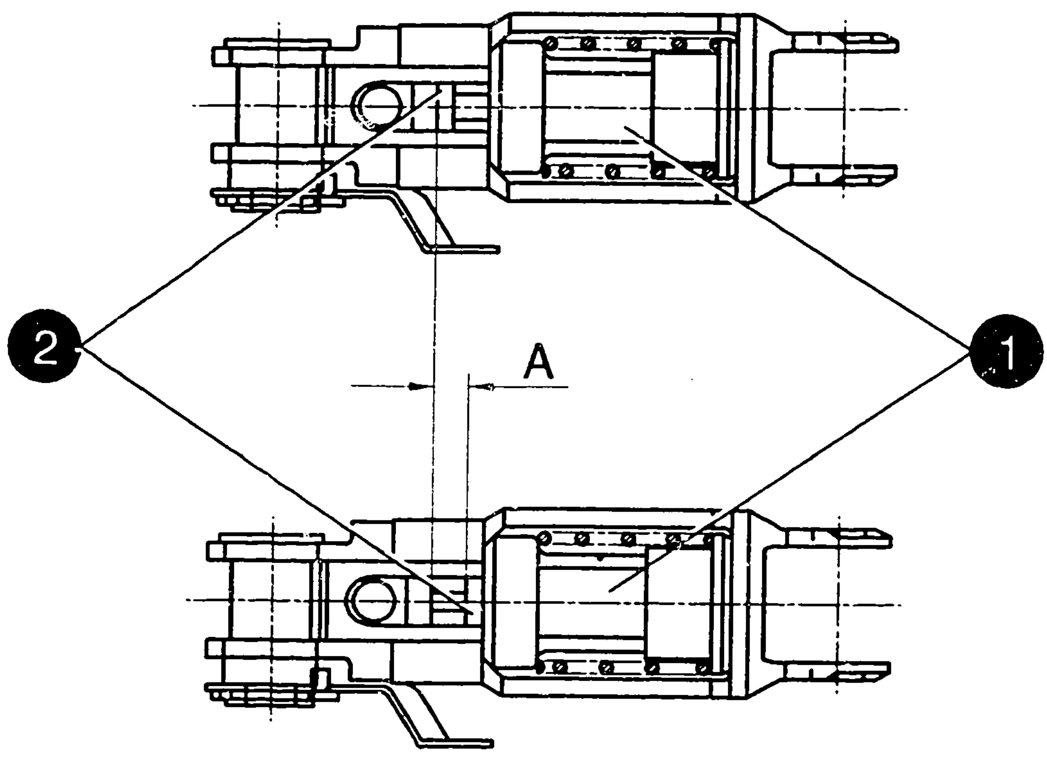
An eccentric bushing (arrow) in the TAS link enables the control-rod travel to be altered by 2x +-0.15 mm by way of detent positions (starting from center position.



KMK01633

The TAS link has to be removed for testing its function. Spray the cartridge of the expansion element (1) with commercially available refrigerant spray for approximately 40 seconds until pressure disk (2) moves in direction of cartridge and comes to a standstill.
Measure travel of pressure disk (dimension A).
Set value: At least 2.6 mm.

Important:
The test described above only makes it possible to determine the travel; it is not intended for establishment of the temperature at the start or end of adjustment.



KMK01634

Notes:

* The control-rod travel with warm start corresponds to the control-rod travel for full-load delivery without charge-air pressure.

* The start and end of adjustment are specified by the expansion element and cannot be altered.

* The complete TAS link must be replaced in the event of repairs on account of calibration work which can only be performed at the factory.

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RQV-K GOVERNOR (MACK)

Workshop: EP
12.1991
0305 En

Assessment of wear on linkage-lever components

Under critical marginal conditions, such as those encountered when governor is chiefly operated at one load point, there is a possibility of increased wear on linkage-lever components. Such wear usually becomes apparent when driving in the form of reduced speed at full load.

Wear on the linkage-lever components is to be determined when carrying out governor repairs.
The individual linkage-lever components are as follows:
- Driving pin and sliding piece
- Cam
- Variable-fulcrum lever

To determine the degree of wear, use is to be made of a commercially available caliper gauge with dial indicator.

Measurement accuracy: 0.02 mm

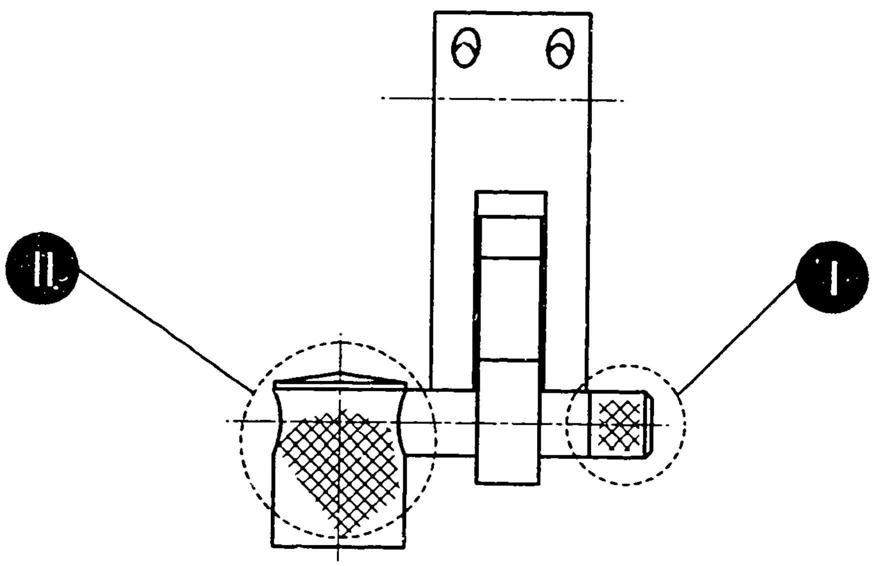
Testing and repair instructions

Driving pin and sliding piece
Measurement, area I

The point of maximum wear is to be determined by means of radial rotation of the caliper gauge about the driving pin in area I.

Wear dimension: 5.940 mm

If the wear dimension is obtained or not reached, the entire assembly is to be replaced.

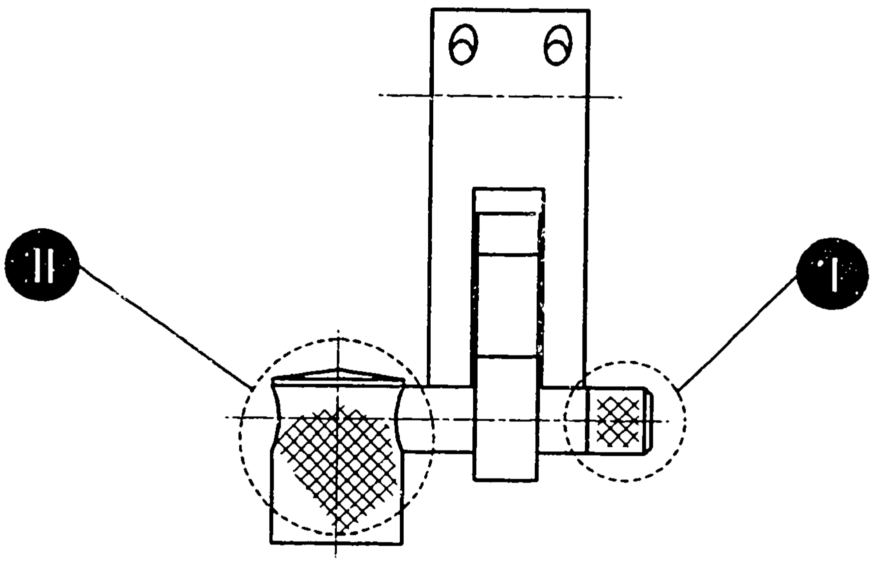


KMK01709

Driving pin and sliding piece
Visual inspection, area II

1. Clearly noticeable axial scoring in loaded area of lateral surface (opposite guide pin welded on end face)
2. Fiber-like grooving in above-mentioned area starting from copper-colored, convex end face of sliding piece

If one of the two situations outlined above is encountered, the assembly is to be renewed. The variable-fulcrum lever is likewise to be assessed.



KMK01709

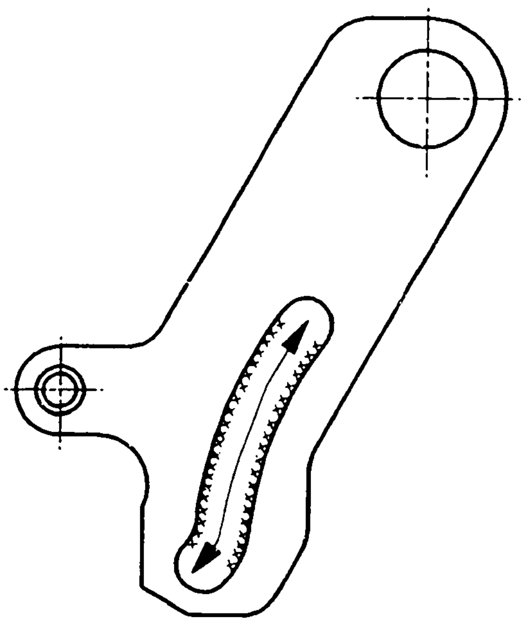
The assembly need not be renewed if the surface is slightly shiny but not scored.

Cam
Visual inspection of working area
(hatched areas in illustration)

1. Pocket-like wear in working area of driving pin
2. Heavy grooving in working area of driving pin

The cam is to be renewed if one of the two situations outlined above is encountered.

The cam need not be renewed if there are shiny areas in the working area of the driving pin, but no noticeable scoring.

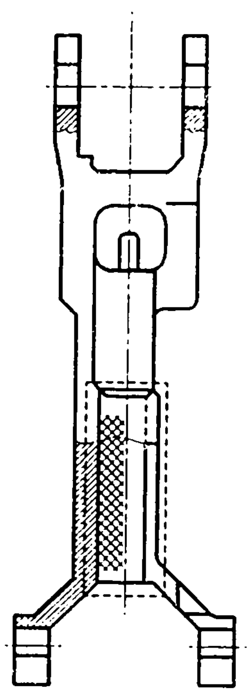


KMK01710

Variable-fulcrum lever
Visual inspection of working area
(hatched areas in illustration)

1. Heavy scoring or material abrasion in working area of variable-fulcrum lever guide
2. Pocket-like wear in working area of variable-fulcrum-lever guide

The variable-fulcrum lever is to be renewed if one of the two situations outlined above is encountered.



KMK01711

The variable-fulcrum lever need not be renewed if there is slight tracking, but no noticeable scoring, in the working area of the variable-fulcrum-lever guide.

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MW IN-LINE PUMP

Workshop: EP
12.1991
0306 En

RENEWAL OF CONTROL-ROD GUIDE PIN

As of now, control-rod guide pins with the appropriate guide sleeves KDEP 1075/1076 are not to be pressed into the MW pump housing.

Guide pins from unserviceable MW pump housings are not to be removed and re-used.

Reason:
Follow-up damage caused by control-rod guide pins dropping out.

When performing repairs (control-rod guide pin bent or broken), exclusive use is to be made of MW pump housings with guide pin pressed in at the factory.

Service-part microcards have been altered accordingly.
New (on-stock) MW pump housings with no pressed-in control-rod guide pin are to be sent back to KH/ALP by way of your RG.

If the guide pin is broken, the warranty situation is to be reported with defect no. 30 and the plain-language message "Control-rod guide pin broken".

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VE DISTRIBUTOR-TYPE
FUEL INJECTION PUMPS
Pneumatic idle
increase (PLA)

Workshop: EP
02.1992
0308 En

This service info deals with testing and assignment of the pneumatic idle increase (PLA) with respect to the LFG (housing-fixed idle spring) stop lever.

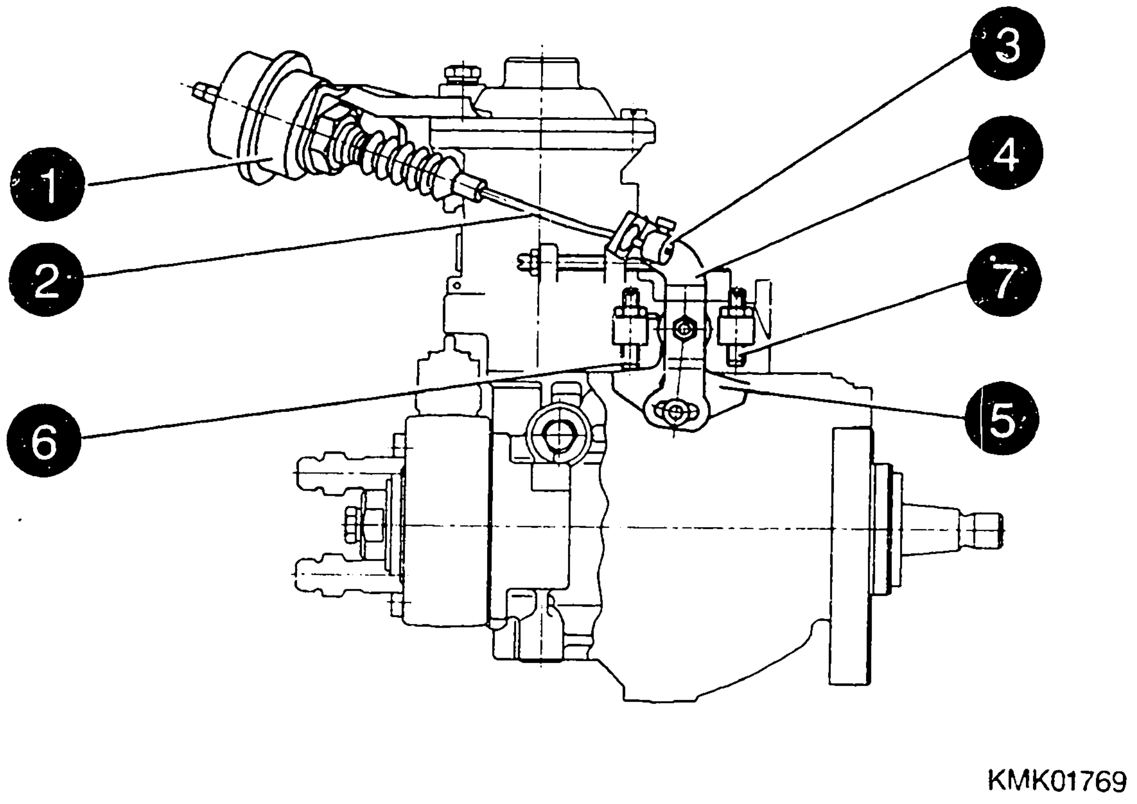
All operations described in this service info refer to VE pumps with LFG attached on left.
The procedure for VE pumps with:

* LFG attached on right
* PLA attached to distributor head

is the same.
The corresponding instructions apply accordingly.

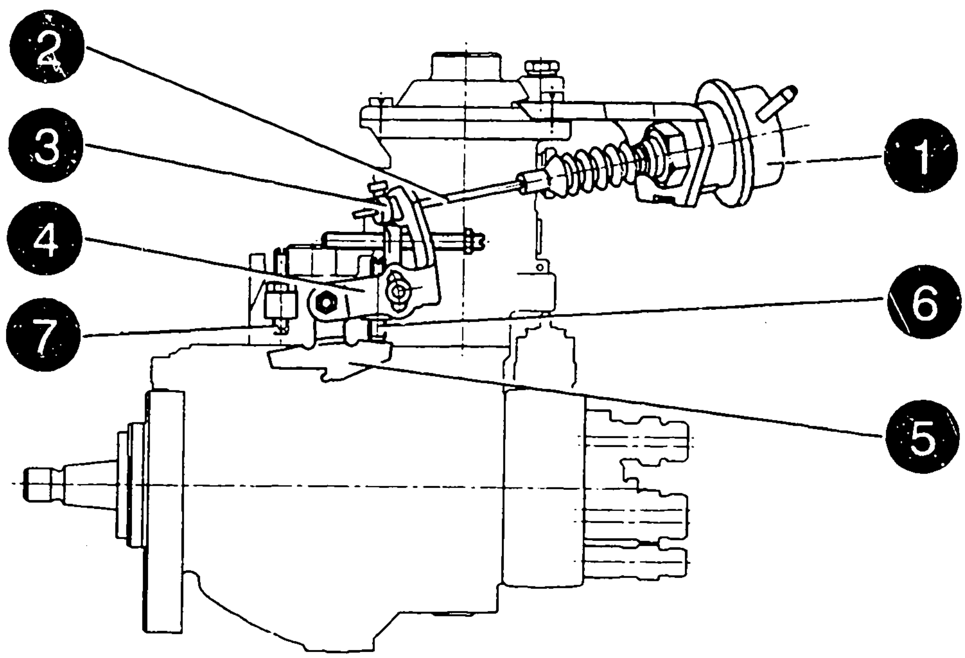
LFG – left-hand attachment

1 = Pneumatic actuator
2 = Wire rope
3 = Adjusting ring
4 = LFG basic lever
5 = LFG stop lever
6 = Stop – low idle
7 = Stop – high idle



LFG – right-hand attachment

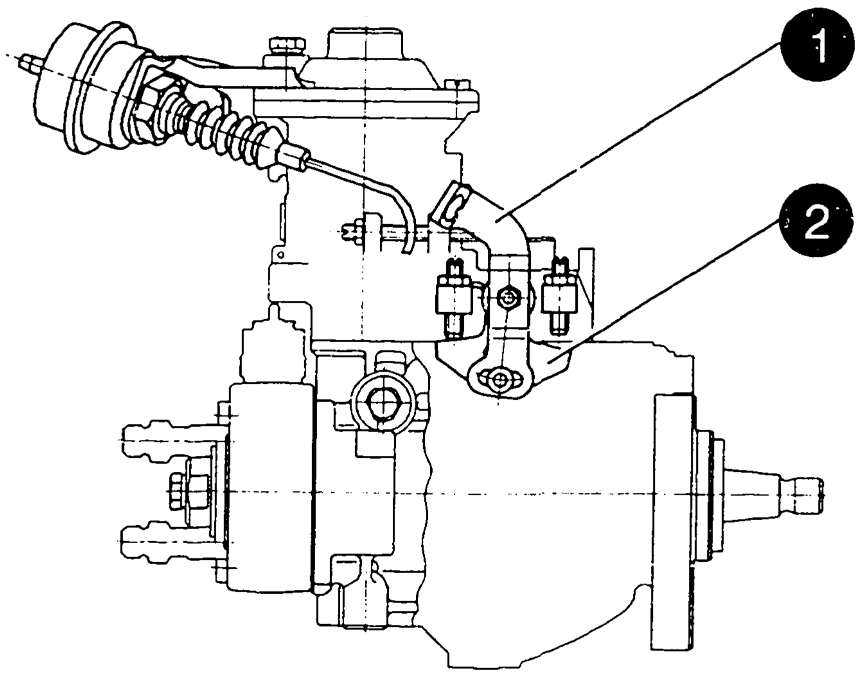
1 = Pneumatic actuator
2 = Wire rope
3 = Adjusting ring
4 = LFG basic lever
5 = LFG stop lever
6 = Stop – low idle
7 = Stop – high idle



KMK01770

A completely adjusted (tested) pump is a prerequisite for the operations listed below.

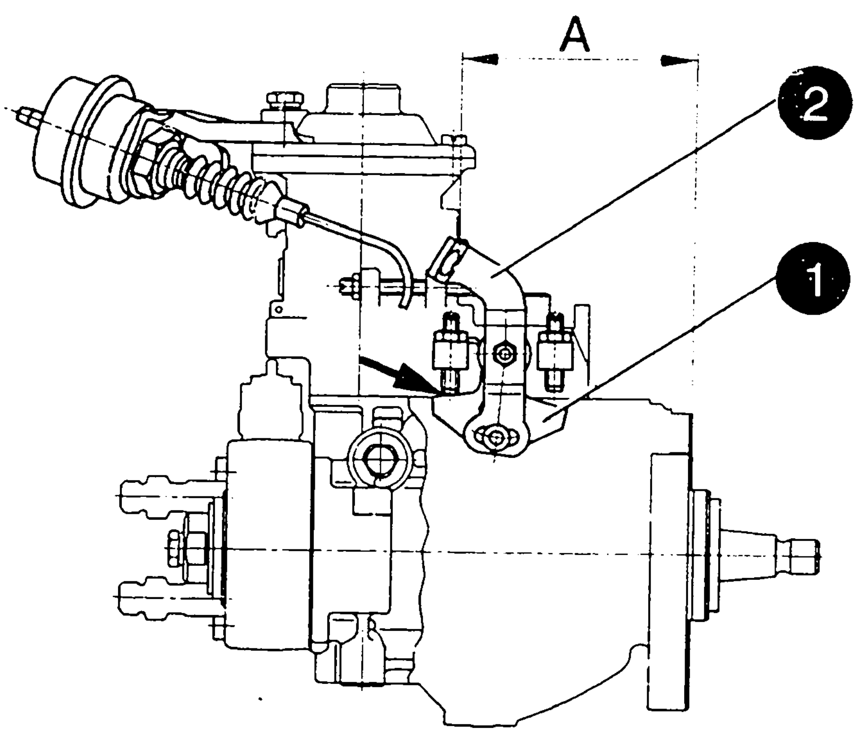
Attach LFG basic lever (1) to LFG lever shaft. Fit hexagon nut and fillister-head bolt together with appropriate washer and tighten by hand. It must still be possible to turn the LFG basic lever with respect to the LFG stop lever (2).



KMK01771

Position (arrow) LFG stop lever (1) against screw for low idle. Adjust dimension A (curved end of basic lever - pump flange) at LFG basic lever (2). Tighten hexagon nut to 3...5 Nm and fillister-head bolt to 5...7 Nm.

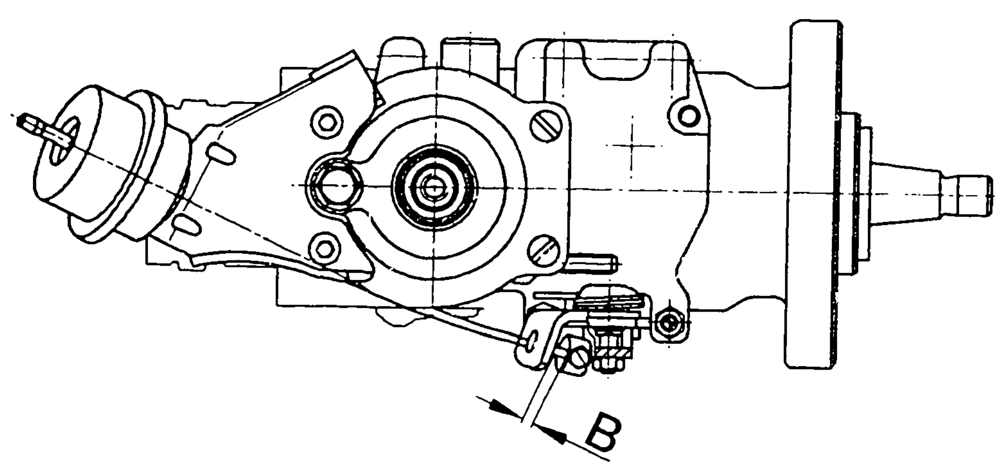
Note:
Dimension "A" is to be taken from the respective pump test-specification sheet under "Remarks".



KMK01772

Insert wire rope through LFG basic lever.
Position LFG stop lever against screw for low idle.
Attach adjusting ring to wire rope and move until dimension "B" (adjusting ring - curved end of basic lever) has been set.
Tighten screw of adjusting ring.

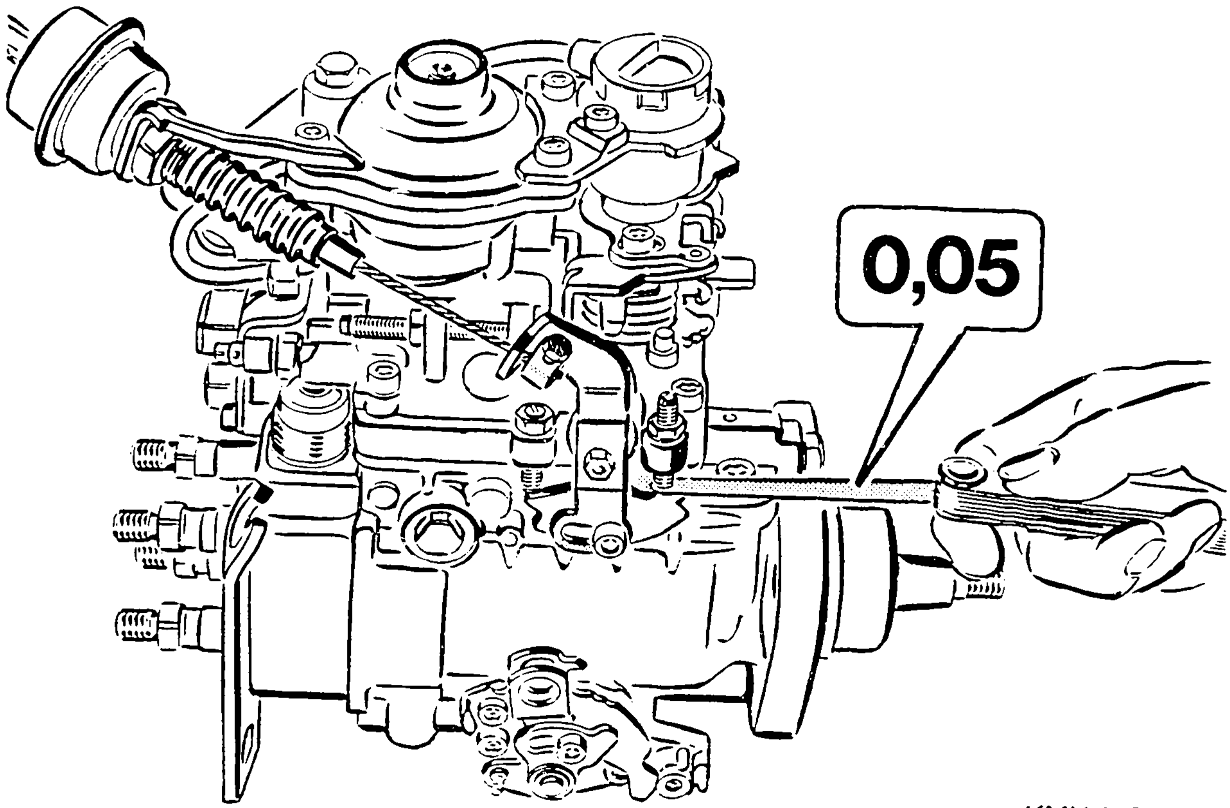
Note:
Dimension "B" is to be taken from the respective pump test-specification sheet under "Remarks".



KMK01773

Connect up vacuum pump to pneumatic actuator.
Set vacuum of 595...605 hPa.
On attaining the set vacuum, the LFG stop lever must be positioned against the high idle stop.

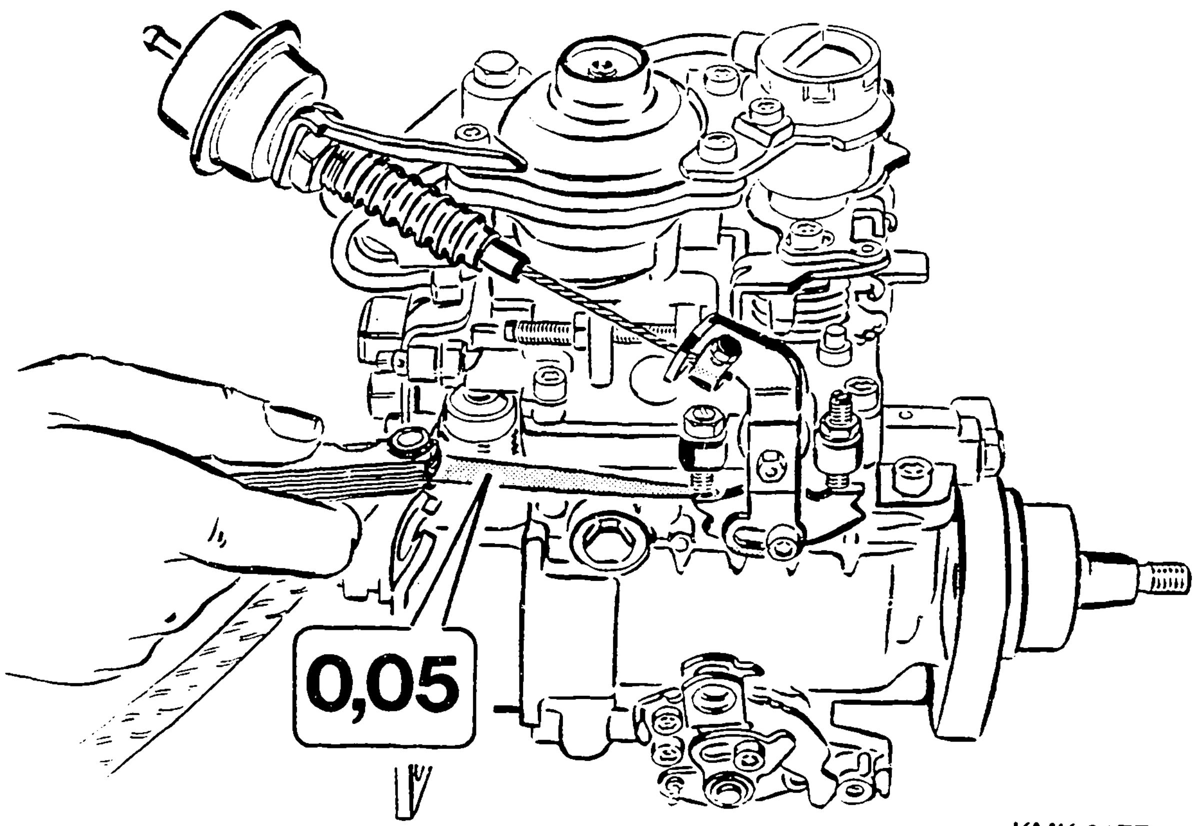
A feeler gauge (0.05 mm) previously positioned between stop lever and stop must now be clamped in position (picture).



KMK 01774

Detach vacuum connection from pneumatic actuator.
LFG stop lever must now be positioned against stop for low idle.

A feeler gauge (0.05 mm) previously positioned between stop lever and stop must now be clamped in position (picture).



KMK 01775

Check dimension "B" (adjusting ring - curved end of basic lever).
If necessary, correct dimension "B" by altering position of adjusting ring.
Repeat vacuum adjustment test.

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